A DIAGNOSTIC STUDY OF THE APTITUDES OF COLLEGE STUDENTS.

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PREFACE

In every part of our country, today there is heavy rush for admissions into the Engineering and Science courses. The admissions are usually based on the examination marks in the previous qualifying examinations. The examination marks, it has been repeatedly alleged, suffer from various limitations like subjectivity, unreliability and even lack of validity. In the United States aptitude tests are being increasingly employed for selecting students for the various courses. This practice has not yet found general acceptance in our country. Consequent on some of the inadequecies of examination marks, it is possible to suspect that some students without the necessary aptitude and intellectual ability may secure admission into these courses while some really competent students may not succeed in securing admission. Further, it is possible that students may seek admission into these courses without actually being interested in the subjects. Thirdly, it is also possible that students may not have vocational preferences in keeping with their courses of study because of the lack of facilities for vocational and educational guidance.

The present study was undertaken to provide an answer for the doubts raised above. Thus the investigation was planned with a purely practical bias. The hope is that this investigation will pave the way for

more studies into this problem and develop certain suitable tests of aptitude, intelligence, and interests which can be usefully employed in selecting students for professional and Science courses.

The report has been delayed by a few months due to certain practical difficulties. We hope that this delay is not considered inordinate.

We are very grateful to the National Council of Educational Research & Training for the financial grant provided for this study. They have not only granted the money but also put up with our delay. We are extremely grateful to our Vice-Chancellor, Dr. D.S. Reddi and our Principal, Dr. Aryendra Sharma, for all the encouragement and facilities they had given us to undertake and complete this study. We are also thankful to the Heads of the different Institutions who had permitted us to carry out the testing and to the students and others who had cooperated by taking these tests. Last but not least our thanks are due to the other staff members of our department, Shri B.Taramanohar Rao, Shri N.Y.Reddy, Shri M.M. Rahman and Shri B.Goverdhan Reddy.

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CHAPTER I.

I N T R O D U C T I O N

E D U C A T I O N deals with the problems of training the individual in various ways. Before the child can be taught, its potentialities and basic nature should be understood. Hence we could see how the principles of psychology have a direct bearing on this one aspect alone. Since every child is a growing, developing organism capable of initiating, achieving and reaching, it is all the more necessary to appraise his potentialities at certain crucial stages and furnish him with proper training.

In any walk of life, the fundamental factors which go with success can be brought under Aptitude, Intelligence Interest and personality factors. Of these, the basic one, probably, is Intelligence. No individual can be conveniently given charge of any task unless he possess a certain amount of intelligence. Again, the degree of intelligence required may vary depending on the nature of the jobs. Thus an individual with an I.Q. of 80 can hardly be entrusted with any work that requires a high degree of intelligence So, as regards intelligence, two points are clear; (1) Any individual, to take up any task, requires certain amount of

intelligence; (2) a high degree of intelligence ~~Question~~ is necessary for certain types of tasks where-as it is not necessary for certain other types of tasks.

The next fundamental requirement would be aptitude which presupposes the individuals success in a given field. If an individual's measured aptitude is high in a particular field, it can be said that given certain training, he would rise to a high degree of efficiency in that field. Lack of aptitude to some extent shows that any amount of training would not take him to satisfactory level.

Personality is defined as the "dynamic organisation, within the individual, of psychophysical systems that determines his unique adjustments to his environment."[1] As we come to see from the above definition, personality is a sum total of the dispositions of the individual. Thus the personality of the individual determines his peculiar mode of behaviour in different situations. If a particular type of response is expected a particular type of personality is desired.

Last in order but not least is 'Interest' which makes the individual go smooth with his task. Lack of interest would, some times, result in grave maladjustment with the job and its environment, in spite of his having the required level of intelligence and aptitude. Interest on the other hand may, in some instances, boost up achievement and create an atmosphere of confidence where-by the individual may fare well in a task where his interest lies.

Thus all the four are ~~more or less~~ important for an individual to perform any task perfectly, although they have their own order of importance. Now let us discuss in detail what these terms denote and their role in human performance.

APTITUDE - INTELLIGENCE - INTEREST

APTITUDE:

Aptitude may be defined as "a condition or a set of characteristics regarded as symptomatic of an individual's ability to acquire with training, some knowledge, skill or set of responses such as the ability to speak a language, to produce music, etc."[2] In referring to a person's aptitude for mathematics or art we are looking to the future. His antitude is, however, a present condition indicative of his potentialities.

Nothing is read in this definition as to whether the "condition or set of characteristics" is acquired or inborn. Very often it has been implied that the term aptitude has reference to a persons native endowments only. However, we want the facts about a person's aptitudes "as they are at present", characteristics now indicative of his future potentialities(future success). Whether he was born with such characteristics or acquired certain enduring disposition in his infancy or matured under circumstances which have radically altered his original capacities, is to be a question not only of great theoritical interest but of profound importance to the society at large, for the answer has bearing on public policy in

regard to universal education, the functions of school and legislation. But it is of little practical use to the individual himself at a time when he has already reached the stage of educational and occupational planning. His potentialities at that period of his development are quite certainly the products of interaction between conditions both innate and environmental. No matter what his constitution, at first, has been; it has unfolded and taken shape during the impact of both favourable and unfavourable stimulation from the environments in which he has developed. And so, when appraising his aptitudes whether for leadership, for selling, or for research, We must take him as he is, not as he might have been.

Aptitude, moreover, cannotes, more than potential ability in performance; it implies fitness, suitability for the activities in question. When appraising aptitudes we are on the alert for the symptoms of "ability to acquire" a genuine observation in the work as well as a satisfactory level of competence.

Aptitude, then, is a condition symptomatic of a person's relative fitness, of which one essential aspect is his readiness to acquire proficiency in his potential ability, and another is his readiness to develop an interest in exercising that ability.

BASIC APTITUDES: Thorndike suggested that there are probably three types of aptitude: Abstract, Mechanical and Social.[9] Since that time, there has been a great deal of specialization and research on the nature and number

of special Aptitudes. Kelley (1928) used factor analysis and a variety of tests in order to study the question and concluded that aptitudes may be classified as verbal, numerical spatial, motor, musical, social and mechanical.[5] Ordinarily Spearman's theories are mentioned under Intelligence. Spearman (1927) employed a different method of factor analysis and concluded that there is one general factor "G," a number of ~~group~~ specific factors such as word fluency, number visualisation, perceptual speed, induction, etc.[7] This research has borne in the Chicago tests of Primary Mental Abilities(PMA) which measures 6 factors -- number, verbal, space, word fluency, reasoning and memory.

I N T E L L I G E N C E:

Many Psychologists have defined Intelligence in many ways which, probably do not agree with each other. Freeman[3] classified these definitions ~~tests~~ into four types:

(i) Here the emphasis is laid on the adaptability of the person to his total environment. One such definition is given by Stevn: "Intelligence is a general capacity of the individual to consciously adjust his thinking to new requirements."

(ii) The second stresses learning ability as the important feature in intelligence. The problem is complicated by the fact that intelligence scores are not really independent of learning.

(iii) Another definition has stressed the ability to carry on Abstract thinking. Terman writes "An individual is intelligent in proportion as he is able to carry on abstract thinking". Our current intelligence tests stress abstract concept of intelligence.

(iv) The other classes of definitions are more comprehensive. Weschler (1944) states that "intelligence is the aggregate or global capacity of the individual to act purposefully, to think rationally and to deal effectively with his environment." [10]

Munn defines intelligence as " the flexibility or elasticity in the use of symbolic process."

Garrett (1946) states that "intelligence includes atleast the abilities demanded in the solution of problems which require the comprehension and use of symbols." [4]

Eysenk taking into consideration all these definitions argues that "intelligence is the ability to acquire knowledge, or the capacity, or quickness of thinking, or depth of profoundity or a combination of some of these, or else something quite different."

A practical definition is one which sets an agreed practical critiria which are universally deemed to contain the definient, though not uniform. Thus almost everyone would agree that intelligence is required in order to do well at school, to be an efficient officer, or a successful business executive, or quite generally to do intellectual work of any kind with an outstandingly high degree of success.

Intelligence tests are useful to determine the expected level of academic success as well as performance in certain occupations. Scores below ~~or above~~ a certain range are considered indicative of poor chance for success, other things being equal. For instance, an intelligence quotient of 110 is usually considered minimum for success in college. A skilled craftsman needs higher level of

intelligence than a semi skilled or unskilled worker. The Army General Classification Test (AGCT) scores made by recruits in different civilian occupations is an example of the general use of intellegence tests. 50% of tailors score between 83 and 112, 50% of draftsman score between 108 and 128 and 50% surveyors fall between 97 and 100. In this way, the scores on the AGCT show the intelligence for each occupation. Of course, on the basis of intelligence test scores alone, predictions cannot be made. Education, interest, aptitude and other things must certainly be considered. It may well be said that the labourers with high intelligence scores are occupationally maladjusted. Another consideration is about the different kinds of intelligence tests. Some task requires higher verbal ability, others higher spatial ability and so on.

The problem of a conseller is to discover, for each individual, the field for which he is best fitted. The counseller, therefore, first of all, must have information concerning the individual's potentiality to learn different things. Obviously, if the individual is unable to perform satisfactorily in a given task, in a particular field, that particular field must be discarded as a possibility. But more important is that if the individual has aptitude along certain lines but is apparantly a slow learner, then advice can be given as to the type of training that is necessary.

Evidence systamatically collected for three decades has indicated the usefulness of intelligence tests scores

in predicting grades in schools. A certain amount of attention has been devoted as to the relationship between the intelligence tests scores and grades in such professional schools as medicine, law and engineering. Only rarely is an individual with an intelligence quotient less than 110 found seeking entrance to a professional school. This restriction of range, therefore, some what obscures the predictive effectiveness of intelligence test scores for a professional training. A greater range, persumably, would bring about a higher validity co-efficient. It may be concluded, therefore, that intelligence tests alone can not satisfactorily predict success in formal training in the technical professions and other courses.

INTEREST

Educational and Vocational interests may be defined as the traits which have significance for educational and vocational success and satisfaction and which are manifested as likes, dislikes, indifferences, preferences and evaluative attitudes. They are correlated, to some extent with Vocational choices but are too deepseated and too general to be perfect indicators of any such specific outcomes as specific educational or Vocational choice.

People also have some interests which are manifestations of firmly ingrained habibts, or of inherited traits These interests are organised.to some extent, and are expressed in tendencies towards selective types of response. Such interests are related to abilities, to inherited characteristics and to stable habits. They are manifestations of individuality.

In so far as a person's individuality is a factor affecting his success and happiness in his occupation, such traits or so called interests, are important in educational and vocational choice. The modern interest inventory has value primarily because the technical method employed tends to confine the results to measurements of these some what stable characteristics.

Interests as defined here are, of course, not independant of other aspects of development: they are, by nature, adjustive mechanisms. As individuals grow up they attain only very gradually the degree of maturity and of personality organisation necessary to a stable adjustment in a complex culture. In growing up, the individual is confronted with several different value systems relating to occupations. He finds these values represented in his environment in the persons of the banker, the minister, the artist, the scientist, the priest, the teacher, etc. The individual tends to make a choice, and the environment tends to make a choice for him in some instances. Because of the complexity of the situation the interests of the individual, at any one time, may be well or poorly formed, mature or immature, appropriate or inappropriate to him, and, therefore, only more or less stable. These interests are to be inferred only through methods which takes account of fairly large number of indicators. Modern measurement of interests is technical, making use of standerdised tests. The typical test includes lists of occupations, school subjects, amusements, activities, peculiarities of people, conditions of work and each of which the individual responds to these in terms of liking, indif-

ference, disliking, ignorance or preference. The subject is usually able to indicate his reaction to such a detail. The details have significance for occupational success and satisfaction. The test is so standardised that the scoring process furnishes the necessary summary of indicators.

Men, in a given occupation, have characteristic pattern of likes and dislikes. The "Strong Vocational Interest Blanks"[8] is standardised in such a way that the individual score indicates the extent to which he has the pattern of likes and dislikes characteristics of persons in each of several occupational groups. For example, by taking the test a boy might discover whether he has the interests characteristic of successful engineers, or of lawyers, or of doctors.

The Kuder Preference Record[6] has similar items arranged in groups of three from which the person tested is to pick out the one most liked and the one disliked activity.

Apart from these three aspects, intelligence, aptitude & interest, there are certain others as "Achievement" which are of definite relevance in a study like the present one; because, achievement is indicative of what an individual is worth at a given time. Thus achievement test is supposed to measure what an individual has learned. Performance on an achievement test, expressed in terms of a score, is used to estimate proficiency in a trade or occupation. The complete measure of achievement, in a given area, involves a question of how quickly, how accurately, how well and at what level of difficulty an individual can perform the tasks taken to represent accomplishment.

However, it is important to realize that the name of a test and its stated purpose do not determine its diagnostic or guidance value. Any test, whether it is called a test of achievement, intelligence, personality or interest, may be used to measure aptitude if performance on that test has been demonstrated to predict future educational or vocational progress.

Thus, despite its name, achievement test may be used to estimate a student's aptitude or capacity to profit from additional training by ascertaining the ~~the~~ relationship between his personal accomplishment and the amount of training to which he has been exposed.

For example, although differing in name, there is a close relationship between batteries of general achievement tests and tests of general intelligence while achievment tests are supposed to measure an individual's potentiality for learning. The communality of function between intelligence tests and achievement batteries is about 90% This raises the question as to why two types of tests are needed when they seem to be measuring the same function. The answer is to be of discrepancy between aptitude, achievement and intelligence. There is not always a one-to-one relationship between individual's scholastic aptitude and the achievement of this aptitude. Thus, there is the necessity of achievement tests for more comprehensive understanding and proper diagnosis of the individual's various capacities.

ADJUSTMENT: Does being well adjusted mean that a person is also satisfied with his work ? Does helping a person to find satisfying work result in his becoming generally well adjusted ? Before we go further with these questions, we must examine what is meant by the terms general adjustment, vocational adjustment, family adjustment, social adjustment and personal adjustment.

"General adjustment is the sum total of or the synthesis of all the special types or aspects of adjustment." Adjustments are learned behaviour, not innate qualities, although, neural and individual make up, make some kinds of learning easier and others more difficult. Behaviour can be learned only as a 'specific' which becomes generalised, not as an abstraction, which is then applied to all situations. The specific situations in which behaviour is learned depend on the growth stage, the family, the community and then the school providing new situations which supplement those of the home. These situations all involve social relationship, and all are also personal, in that they not only provide inter-personal action but also intrapersonal action. Hence, we may reason that personal and social adjustment are related but not necessarily identical entities first learned in family, neighbourhood and school situations which provide both interpersonal and intrapersonal experiences. In late adolescence or early adulthood, work takes the place of school as an adjustment situations and the community replaces the neighbourhood,

CONCLUSION

Success in any academic course or training, thus depends on antitude, intelligence, interest and adjustment (personality factors). At the higher levels of education, as vocational interests and likes also enter into the picture as another variable. To be realistic, excepting in a few cases, education must be vocation oriented and connected. This is rarely the case in our educational system excepting in the case of professional courses. Many of our science and arts graduate students pursue their studies without any clear idea as to the job they would like to take up after their education. Many of them join courses which are clearly unconnected to the jobs they would like to take up. Many students pursue science courses but still want to become Deputy Collectors or Tahsildars. Even among the students of Professional courses, quite a few are there whose interests in the concerned profession are not intrinsic but extrinsic, i.e. financial prospects, prestige, etc. Thus, in many instances, one finds discrepencies between educational interest and course pursued and between vocational interest and course pursued.

A more basic problem centres around the criteria and procedure for selection and admission. Invariably, the criterion followed is the examination marks at the prerequisite examination. These marks are inadequate for many reasons, like unreliability, lack of validity as measures of the concerned ability, etc. Even the criterion of marks is not ~~er~~ uniformly employed, because of considerations like backwardness of the group to which a student

belongs, backwardness of the region, etc. Because of these factors, it is possible, that some students with high marks and not high degree of abilities may get selected. Similarly, students with low marks and low abilities may also get selected. Such instances, it is obvious to anyone, do not contribute either to the Nation's progress or to the individual's success.

It was felt that a scientific and objective attempt to investigate some of these problems would be useful and pave the way for large scale and more controlled diagnostic studies. The problem assumes more importance in the case of science and engineering students, because of the dire need for well trained and competent scientists and engineers in the context of our plans for national development. The present study is to be viewed as an attempt to initiate studies in this direction. In the following chapter, the specific aims, and objectives are explained in detail.

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CHAPTER II

AIM AND TECHNIQUE OF THE STUDY

The main aim of the present study was to make a diagnostic study of the aptitudes of college students. Apart from this, it was also decided to study the level of general intelligence, educational preferences and vocational interests of the students, because, in addition to the specific abilities (or aptitudes), these factors- general intelligence, educational and vocational preferences. also contribute to success in a particular course. More light can be thrown on the problem of aptitudes if studied in the context of vocational and educational interests and general intelligence.

The following specific problems will be examined:

(1) Whether there are many students in higher classes who do not have necessary aptitudes for such studies:

This problem is connected with higher classes, i.e. graduate courses in Science, Engineering and other technical courses as well as Arts. There is a general assumption that, in higher classes, there are many students who are not really fit for such studies. This assumption is, however, to be tested.

(2). Another problem, no less important, is to see to what extent the courses preferred by the students agree with the courses pursued.

(3) Whether actual courses pursued are in consonance with the students' aptitudes:

There is good reason to doubt that in any course, under the present circumstances of our educational system, there may be some students who do not have the necessary aptitude for the course pursued. This is true of professional courses - Engineering, Medicine, etc., as well as of higher studies in Arts and Science. If this is happening, as we assume, it is obviously a wastage for the individuals as well as for the nation. But to take any steps to avoid such undesirable thing, a study of this problem based on factual data is a prerequisite.

(4) Whether the students' educational and vocational preferences and aspirations are related to their aptitudes:

Generally, students like certain educational courses while they may dislike certain others. They also aspire for vocations of their choice. But, it may be assumed, most of these preferences and likes are based on their desire to take up highly 'prestiged' and 'most repaying' vocations. Their aptitudes play very insignificant part in their likes or preferences. Some research studies also have approved of this general assumption. There are some data reported in the manual of Differential Aptitude Tests, (DAT). Most of the co-efficients of correlation between the DAT scores and the responses to Kuder Preference Record are negative. It is not a strange thing that many of the Indian students prefer to pursue

courses in Engineering or Medicine and to take up a profession in these fields after completion of their education; and in doing this, students usually give little importance to their specific abilities or aptitudes required for success in the preferred courses or profession. Hence the problem is worth studying.

(5). It was also decided to establish predictive validity of the aptitude tests. This problem is not connected with the main aim. But it will be a useful contribution to validate such tests with the data at our disposal and involving not much extra labour but only some time.

The aptitude tests should be capable of predicting success or failure of the students in their respective courses. Engineering aptitude tests, for example, should predict the success or failure of a given Engineering student, if these tests are administered to him in his first year or just before his admission to the Engineering Course. Such of the tests only as could do this job are regarded valid. Hence validation of the tests, intended for use with the students, as measures of aptitudes, is all the more an important task.

In studying the above problems, however, it was decided to restrict this study to Engineering, and Science students only. Students of other courses, such as Medicine, Agriculture, would not be included in the study. The reason for this is that, there are no tests available for these aptitudes, medicine, agriculture, etc., which can be readily used.

Second, if all these students are included in the study, it will become very extensive and the work will not be completed within the limited period of the project. However, students of Arts are included to serve as control group. This was necessary in view of the absence of set norms for Indian population.

THE TECHNIQUES EMPLOYED:

It was decided to select or design proper tests and questionnaires for the following purposes:

(a) to measure General Intelligence

(b) to measure Scientific & Engineering Aptitude

(c) to know the Vocational Interests

(d) to acquire Information regarding Educational preferences.

The decision to include intelligence tests, in addition to aptitude tests and the tools for knowing educational and vocational interests was made for two reasons: (1) In addition to specific abilities, general intelligence is an important factor for success in any field of education or training. (2) Second, for Arts students intelligence tests may serve as a scholastic aptitude tests.

Several measures taken to select or design the tools employed are as follows:--

Various psychological departments in the country were contacted to find out whether they have tests, constructed under Indian conditions, to measure different aptitudes. It was found there are no such tests available. If there are any developed in our country they are not for sale.

The only alternative, then, was to adopt some foreign tests.

After considering several batteries it was decided to employ some tests(described later in this chapter) from "Differential Aptitude Tests" (DAT) and the "Engineering and Physical Science Aptitude Tests"(EPSAT), for the following reasons:

i) The tests selected are, as they should be, useful for the two groups of students - Engineering & Science on whom the present investigation is mainly directed.

ii) They have high reliability and validity.

iii) Some efforts are being made to standardise these tests in India.

iv) They are also most widely used. Plenty of data are available to show reliability and validity of these tests.

For all these reasons the tests selected have been found most convenient and suitable for the purposes of the present study. These tests are given below:--

(A). <u>To Measure General Intelligence</u>:

(i) Arithmatic Reasoning,(ii)Verbal Reasoning
(iii) Abstract Reasoning.

The first test is taken from EPSAT and the latter two from the DAT Battery.

These three tests can be relied upon as approximate measures of different aspects of general intelligence.* The Arithmatic Reasoning consists of simple arithmatic

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* Bennet, G.K., Seashore, H.G. & A.G.Wesman(1959): Manual(3rd Edn), Differential Aptitude Tests, Psycho. Corp. New York. P.5.

problems. It indicates the student's ability to understand numerical relations and to handle numerical concepts.

The Verbal Reasoning provides " a measure of ability to understand concepts framed in words". It evaluates the student's ability to abstract or generalise and to think constructively "rather than simple fluency or vocabulary recognition."

The third test "Abstract Reasoning" is a "measure of the students' reasoning ability". Each problem in this test consists of a series of figures and an operating principle. The student has to perceive this principle in the changing figures and give evidence of this understanding by selecting the "diagram which should logically follow".

(B). <u>To Measure Scientific And Engineering Aptitude</u>: (1) Formulation, (2) Mathematics (3) Physical Science Comprehension, (4) Mechanical Reasoning and (5)Space Relations.

Among these five tests, the first three have been selected from the EPSAT and the remaining two from the DAT.

In the test, "Formulation" are found 10 algebraic problems, each in the form of a statement. The student has to understand the relation of various concepts in each statement and construct a formula(algebraic expression) for this, using algebraic symbols.

The other two tests from EPSAT consist of problems one in Mathematics and the other in Physical Sciences. These give a measure of students' mathematical knowledge and physical science comprehension respectively.

The "Mechanical Reasoning" successfully "measures understanding of mechanical and physical principles in familiar situations." The other test from DAT, Space Relations, measures, as the authors suggest, two things - the ability "to visualise a constructed object from a picture of a pattern" and the ability "to imagine how an object would appear if rotated in various ways". Broadly speaking it is "a measure of ability to deal with concrete materials through visualisation."

It was felt, all these five tests would be useful as tests of Egnineering and Scientific aptitude. An account of the reliability and validity coefficients of all the tests included in set (A) and set (B) is given later.

(C). Vocational Interests:

For the purpose of studying the Vocational Interests, it was decided to adopt the Vocational Interest Check List of the Ministry of Labour and Employment, Govt. of India with necessary modifications.

There are 150 items in this check list. The list, it was felt, was too long for use in this study in view of the time and patience (or motivation), required, of the students. So, an effort was made to shorten the list. The following were the several steps taken:

(1) Some unimportant items(which are not applicable to this study) were omitted.
(2) At various places items were reframed
(3) Some completely new items were coined.
(4) A few new areas of vocation were added keeping in view the sample studied. These were (i) Defence,

(ii) Diplomatic and Foreign Service, (iii) Entrepreneaur, (iv) Public life and (v) Public Relations.

As a result of these modifications the final list contained only 98 items and the list was named Vocational Interest Blank.

The whole structure of the Blank is as follows:--

Vocational area	No. of Items
1. Administrative	3
2. Arts	5
3. Biological	4
4. Chemical	3
5. Clerical	4
6. Defence	8
7. Diplomatic & Foreign Service.	4
8. Engineering	12
9. Entrepreneaur	3
10. Farming	3
11. Handicrafts	4
12. Legal	4
13. Literary	4
14. Medical & Health	4
15. Physical Sciences	4
16. Protective	4
17. Public Life	4
18. Public Relations	4
19. Selling	4
20. Social Sciences	5
21. Teaching	4
22. Welfare	4
Total Items	98

(D) Educational Preferences:

In addition to the above Vocational Interest Blank, a questionnaire was designed to study educational interests and preferences. In this questionnaire there are some

items regarding vocational preferences also. This questionnaire was tried out on a sample of (152) students; and some necessary changes were made.

The questionnaire was intended to seek such personal data as the students' age, sex, present course of study, information regarding parents' educational level, occupation and family income. It further studied the attitude of students to their 'present course', and to various subjects in it, whether the students like, dislike or are indifferent to the courses pursued, etc. Further data gathered by the questionnaire were:

(1) What are the other courses preferred by the students
(2) How the students evaluate different attributes of jobs as to their importance; and
(3) The vocations, preferred by the students, to be taken after completion of studies.

However, results regarding the items related to vocational choice have not been discussed in this report.

RELIABILITY:

One of the important problems before taking up any test for use in a research study, is to establish the reliability i.e. the consistency of the test. The reliability of the tests, adopted for the present study, was established by the test constructors. Very high co-efficients of reliability have been reported for these tests. The following are the co-efficients of (self) correlation found by employing split-half method for the tests taken from the DAT.

	Boys	Girls
** Verbal Reasoning	.90	.90
Abstract Reasoning	.90	.89
Mechanical Reasoning	.85	.71
Space Relations	.93	.90

However, for the EPSAT tests, reliability co-efficients, found by Split-half method, have not been reported for each test separately. But a reliability co-efficient of .96* has been reported for the EPSAT total score. The EPSAT consists of six tests of which four would be used in this study. No correlation coefficients indicating long term consistency (retest reliability) have been reported for these tests.

The co-efficients of(self) correlation of the four DAT tests indicating long term consistency are as follows:--

	Boys	Girls
*** Verbal Reasoning	.86	.84
Abstract Reasoning	.59	.74
Mechanical Reasoning	.69	.60
Space Relations	.62	.73

V A L I D I T Y

The Validity of a test can be defined as the "Degree to which the test measures what it purports to measure." This is very important, and unless a test fulfills this condition it can not be used as measuring instrument. There are many ways to establish the validity of a test,

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** Bennet, G.K., Seashore, H.G. and A.G.Wesman(1959): Manual(3rd Edn.)Differential Aptitude Tests, Psycho.Corp. New York, p. 66

*** Op. cit. p. 68

* Moore, B.V., D.J.Lapp. and C.H.Griffin(1951):Manual(Revised) Engineering and Physical Science Aptitude Tests, Psychol. Corp. New York, p. 7

for example, comparing the scores on the given test to the scores on other tests with already established validity, matching the test results to ~~actual~~ actual observations of behavior in real situations, correlating the test scores with later success or failure in the corresponding fields of education or vocation.

The DAT tests were validated in several ways by the test constructors. The scores on these tests were correlated with scores on other accepted standard tests such as Henmon-Nelson, Ohio, Otis-Q.S., Otis S.A.* Co-efficients of correlation of the four DAT tests, included in the present study, with the above tests are as follows:--

	Henmon Nelson.		Ohio State Psy.Exam.		Otis Q.S.		Otis S.A.	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
1.Abstract Reasoning.	.52	.71	.42	.45	.57	.47	.65	.69
2.Mechanical Reasoning.	.31	.56	.45	.38	.40	.44	.61	.61
3.Space Relations	.26	.65	.35	.29	.41	.56	.58	.58
4.Verbal Reasoning	.73	.77	.79	.76	.73	.75	.81	.84

Further the percentile equivalents of average scores of students were examined in relation to the students' later educational attainment and occupational fields. Here also the tests have been found fairely valid.

The EPSAT tests also showed a high validity when the course grades of 188 Men and women in Introductory Engineering subjects at the Pennsylvania State College were compared to the scores on these tests.

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* Bennet, G.K., Seashore, M.G., and A.G.Wesman(1959): Manual(3rd Ed.) Differential Aptitude Tests, Psychol. Corp. New York, p. 72.

	Course Grades		
	Maths	Chemistry	Physics.
* Mathematics	.71	.59	.55
Formulation	.53	.60	.54
Phys.Sc. Comprehension	.34	.48	.60
Arithmatic Reasoning	.49	.32	.49

These tests were also correlated with other tests. ** The co-efficients of correlation of the EPSAT total score with the Minnesota Paper Form Board and with the Wonderlic Personnel Test, Form D are .37 and .66 respectively.

~~(b)~~ Subjects for the study:

Engineering and Science students constituted the main sample of the study. A group of Arts students were, however, included to serve as a control group. A comparison is to be made with Arts students, because we do not have norms for Engineering and Science students, against which their performances could be compared.

ORIGINAL PLAN

The size of the sample in the final study, as originally planned, was to be about ~~one thousand~~ 1000 students. These would include students of different colleges under the jurisdiction of the three Universities in Andhra Pradesh, namely Osmania (Hyderabad), Sri Venkateswara (Thirupati), and the Andhra University (Waltair).

*B.V.Moore, C.J.Lapp and C.H.Griffin(1951):Manual(Revised) Engineering and Physical Science Aptitude Test, Psychol. Corp. New York, p. 6.

** Op. cit. p. 8

To satisfy this condition, it was decided to draw a sample from the following five centres. However, it was not possible to draw a sample from one centre(Waltair) due to ~~a~~ some practical difficulties.

1. Hyderabad } Both under the jurisdiction of the
2. Warangal } Osmania University.
3. Tirupathi } Both under the jurisdiction of
4. Anantapur } Sree Venkateswara University.
5. Waltair — Andhra University.

200 students would be taken up for study from each centre. And these 200 students would include students of B.E. Ist year, B.Sc. Ist year and B.A. Ist year. However, this original plan could not be strictly followed due to several practical difficulties; and details regarding the students actually tested are given later in this chapter.

PRELIMINARY STUDY:

A preliminary study was carried out for the following purposes.

(1) To finalise the questionnaire seeking personal data and educational preferences:

The questionnaire designed to study educational preferences was administered to (152) ~~Ist year~~ students of B.E. Ist year, B.Sc. Ist year and B.A. Ist year, (90) of these students belong to urban area (Hyderabad city) and the remaining (62) to semi-urban area (Warangal). Based on the findings of this administration, some necessary modifications were made and the questionnaire was finalised.

In the previous form, the students had to answer a question and give some reasons also in case of most of the questions. For example, there is a question "Did you choose your present course on your own choice ?" If the student responded "Yes", he had to state those considerations which led him to choose the present course.

Again if the student does not like the present course and prefers some other course what are the reasons for it ? Now, all the reasons given by the students in connection with a particular kind of response to a question have been grouped under some broader, yet meaningful and specific, categories. These categories have been included in the final form making it mostly a close-end questionnaire. The student now, has only to pick out three most important reasons from among the many listed in the questionnaire. Apart from this, some more minor changes have been made, but the main content of the previous form remained the same in the final form also.

(2). The eight tests selected to measure intelligence and aptitudes were administered to 150 first year students, 50 each from B.E., B.Sc. and B.A. No time limits were imposed, but the students were asked to perform as quickly as possible and complete all the items. The results were used to serve the following purposes:

(i) <u>To fix time limits for the tests</u>:

The tests selected were standardised on American sample. So the original time limits, it was felt, may not be applicable to our sample. New time limits are to be fixed. For this, the time taken by each student to complet

individual tests was noted at the time of administration.

It was found that Arts students had taken less time or worked for shorter time with the tests than the Engineering and Science students. But their performance was poor and was less reliable. Though the students of Engineering and Science needed more time, their performance was much better, and sincere and reliable. Due to this reason and also the fact that Engineering and Science students are the main sample of the study, the best consideration was given to the requirements of these groups - Engineering and Science - in fixing time limits of the tests. The principle followed in fixing these limits was that at least 85 or 90 per cent of the students (necessarily of the main sample) should have completed the test i.e. all the items on it. The following are the original and new time limits:

Name of the Test	Original time limit	Newly fixed time limit.
1. Arithmatic Reasoning	15 min.	15 min.
2. Formulation	10 "	10 "
3. Mathematics	15 "	-
4. Phys.Sc. Comprehension	10 "	12 "
5. Abstract Reasoning	25 "	35 "
6. Mechanical Reasoning	30 "	40 "
7. Space Relations	30 "	40 "
8. Verbal Reasoning	30 "	40 "

(ii) To determine the discriminative capacity of the Tests:

The tests employed should have the capacity to differentiate between different groups of students - Engineering and Science on the one hand and Arts on the other. This is a necessary condition which should be satisfied.

It was assumed that Arts students would perform better on Verbal Reasoning than either Engineering or Science students, as the test requires, of the students, good verbal fluency and verbal recognition. Nothing can be suggested as to which group would score higher in Abstract Reasoning. These two were included in the set of intelligence tests. But, on the remaining tests, Engineering and Science students may be expected to do better than Arts students. So far the differences between Science and Engineering students are concerned, Science students may prove better in Physical Science Comprehension, and Engineering students in Mechanical Reasoning and Space Relations.

These assumptions were tested in the preliminary study, and the tests were found to discriminate between the main sample (Engineering and Science) on the one hand and the control group (Arts students) on the other.

(iii) <u>To find out the discriminating capacity within the group</u>.

A test should also have discriminatory capacity within the group. That is, the scores obtained by a single group of students should be spread over a considerable range. In other words, the criterion that the "Low group" and "High group" should differ significantly must be satisfied. For this purpose, the 25% of a group of students who got the lowest scores were considered the 'low group', and the same percentage of Ss with the highest scores were considered the 'high group'.

The preliminary study showed that "Mathematics" did not have considerable spread of scores with respect to the Science and the Engineering students. Most of the students scored very high in this test. So,it was decided to exclude this test in the final study.

(iv) To establish validity of the tests:

Though validity has been established by the authors of the tests,it would be desirable to establish the same with the Indian students as the sample. There were two ways for this:(a) to obtain college marks and find out correlation between these marks and the scores on the tests. This gives concurrent validity of the tests. (b) To administer the tests to successful candidates - those who have successfully completed their degree courses either in Engineering or Science. Performance of these candidates would be compared with the performance of first year students. Significant differences were expected,because the achievement of the senior candidates in the respective educational field would definitely be higher than the achievement of first year students.

Because of some practical difficulties, however, this aspect of preliminary study could not be completed. It was not so easy to get the senior candidates - Engineering or Science graduates - as it was with the students sample. Secondly, the tests employed in the study have been already validated by the authors employing different methods. All of them have been found highly valid(the validity co-efficients have been reported in a preceding page).

For the above reasons, it was decided to start the final study without waiting for the findings of a validation study.

F I N A L S T U D Y:

Data for final study were collected in two parts. The first part consists of the two questionnaires - "Vocational interest Blank" and the "General Information and Educational Preferences and Interests." The second and the major part of the testing programme included the tests of general intelligence and aptitudes. Seven out of the eight tests were selected on the basis of the results of the preliminary study. One test, "Mathematics" was excluded.

The whole sample studied includes samples of B.E., B.Sc. and B.A. Ist year students, the total number of the students being 744. The details of the strengths of different groups are given below:-

SAMPLE	No. of Ss. taking all tests	No. of Ss. taking only DAT Tests.	No. of Ss. taking EPSAT test only	Total No. of the whole sample.
B.E. Ist Year	400(-)	-	-	400
B.Sc. Ist Year	130	30	47	207
B.A. Ist Year	51	72	14	137
	581	102	61	744

Originally, it was decided that all the tests should be administered to all the students in the sample. But, due to several difficulties, this was not possible. Hence, it was designed to administer all the tests to as many

students as possible; and wherever this would not be possible either DAT or EPSAT tests only would be administered. The above table gives the actual number of students tested. These numbers vary even on individual tests. The actual numbers of students are given in each table against the respective tests in chapter III, where the results are discussed.

The difficulties that made administration of all the tests to all the students not possible were that (i) Each student was required to sit for more than four hours if all the tests and questionnaires were to be administered. Two or three sittings were necessary. But this was not practically possible.

(ii) Secondly, it was felt that, it was not necessary to administer all the tests and questionnaires to every student. The sizes of the samples were adequate. The groups of students formed in the scheme of administration could satisfy the criterion of "matched groups". However, all the tests and the questionnaire were administered to all the Engineering students. This had become impossible only with the B.Sc. and B.A. students.

Though, it was planned to administer the two questionnaires to all the students, this was not, practically possible with the B.Sc. and B.A. groups. So, these questionnaires were administered to the maximum possible number of students, in the case of the B.Sc. and B.A. students.

Details of the students from each group, who were administered the questionnaires are as follows.

	No. of Ss administered the "Educational Preferences"	No. of Ss, administered the 'Vocational Interest Blank'.
B.E. Ist Year	300	315
B.Sc. Ist Year	110	125
B.A. Ist Year	64	64
Total	474	504

Besides the above groups of 1st year students, a sample of senior students; Engineers and Researchers were also studied for comparison of the performance of the 1st year students with that of these groups. Details about these samples are ~~as~~ given below:

1. Persons engaged in Research (Regional Res.Lab. Hyd.) 13
2. Engineers (B.H.E. Ltd.) 19
3. B.E.Final (Sri Venkateswara University, Osmania & Reg. Engg. college ~~Anantapur~~ Warangal, and Govt. Engineering College Anantapur) ~~students~~ 193(-)
4. B.Sc. Final students (Osmania University: Saifabad Science College) Hyderabad. 40(-)
5. M.Sc. Final students (University Science College, ~~O.U.~~ Osmania University) 18

Total 283

All the ~~students~~ subjects in these samples were administered all the seven tests. The results of these are discussed in the chapter on "Side Lights."

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CHAPTER III

APTITUDES OF THE STUDENTS

A study of the aptitudes of College students is very useful, specially now when there is a widespread notion that examination marks at the school or college level cannot be exclusively relied upon, for admissions to professional, Science and technical courses. The importance of such a study has been discussed in detail in the preceding chapter. In this and the following chapters, an analysis and discussion of the results of this study will be made and warranting conclusions drawn.

The present chapter is devoted to the analysis of the results obtained from aptitude tests. This chapter is devided into three sections - A, B and C. A comparative evaluation of the general performance of the different groups of Engineering, Science and Arts students will be made in Section A.

For the purpose of comparative study of the performance, the Ist year students have been grouped as follows:-

(1) The 'whole group' consisting of three samples, of the B.E., and B.Sc., and B.A. students.

(2) The 'B.A.+B.Sc.' group consisting of the samples of B.A. & B.Sc.

(3) The 'B.E. Ist year - The sample of B.E. Ist year students

(4) The 'B.Sc. Ist year - the sample of B.Sc. Ist Year

(5) The 'B.A. Ist Year - the sample of B.A. Ist Year.

These groups will be compared with regard to their performance on the various(seven) tests employed.

In section B, percentile scores of the above groups, on the seven tests, will be analysed and discussed. The percentile scores reported are 25th, 50th 75th and 10?th.

Section C presents the pattern of distribution of performance, on different tests, in the various groups.

In Section D, an examination of the correlation of the seven tests with the examination marks of the students in the 1st year examination will be made to find out the predictive ability of those tests.

S E C T I O N A

Mean scores and Standard Deviation values on each test were worked out and are reported in Table-1, for the two combined groups - the 'Whole group' and the 'B.E.+ B.Sc.' group and for the separate samples of B.E. Ist year, B.Sc. Ist year and B.A. I-t year students. Table-2 shows the critical ratios worked out for the differences in the mean scores.

It may be observed from table-1 that the performance of the whole group(B.E.+B.Sc+ B.A.) was poorer than that of the B.E. sample or B.Sc. students. It was, obviously, because this whole group includes the B.A. sample also besides the B.E. and B.Sc. students. Performance of the B.A. students was much poorer than that of the other two samples.

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TABLE -1

Mean scores and Standard Deviation of different groups of Ss on various tests.

		Whole group	B.E. Ist & B.Sc Ist Yr	B.E. Ist Year.	B.Sc. Ist Year	B.A.I. Year
Abst. Reas.	N:	678	540	389	160	129
	M:	27.56	30.66	32.70	25.70	14.29
	S.D:	13.19	10.03	8.10	9.76	12.15
Mech. Reas.	N:	678	560	400	160	116
	M:	21.89	23.86	25.22	18.72	12.35
	S.D.:	11.70	11.38	10.50	12.01	8.24
Space Rela.	N:	631	520	360	160	111
	M:	28.61	31.57	35.30	21.25	14.39
	S.D.:	20.11	20.37	20.70	14.80	11.31
Verb. Reas.	N:	682	555	400	155	127
	M:	12.95	13.94	14.52	12.71	9.85
	S.D.:	6.21	6.14	6.11	5.87	5.59
Arith. Reas.	N:	640	575	400	175	65
	M:	4.91	5.25	5.44	4.91	1.92
	S.D.:	2.55	2.43	2.43	2.35	1.46
Formulation	N:	682	567	390	177	65
	M:	6.24	6.76	7.25	5.69	1.72
	S.D.:	2.89	2.48	2.34	2.56	1.74
Phy. Sc. Compre.	N:	600	585	360	175	65
	M:	7.92	8.54	10.39	7.04	1.59
	S.D.:	7.01	7.17	7.11	7.17	2.67

TABLE - 2

Critical Ratios for the Differences of Mean Scores of B.E. I, B.Sc. I & B.A.I.

Test	Pairs of groups compared		
	B.E. I & B.Sc. I	B.E. I & B.A. I.	B.Sc. I & B.A. I.
Abst. Reas.	7.95	16.00	8.65
Mech. Reas.	6.57	14.50	5.20
Space Relations	9.15	13.90	4.32
Verbal Reasoning	3.22	8.02	4.19
Arith. Reas.	2.91	16.07	11.33
Formulation	6.94	22.40	13.65
Phy. Sc. Compren.	5.09	17.50	8.56

The performance of the B.E. + B.Sc. group was better than the performance of the whole group. The reason is, in the whole group the B.A. students were also present. B.A. students performed very poor in all the tests. The B.E. + B.Sc. group scored higher on all the tests, than either the B.Sc. or B.A. students because, the combined group (B.E. + B.Sc.) includes the B.E. students whose standard of performance was very high. Further, the group of B.E. + B.Sc. secured lower scores than the B.E. students; ~~because~~ for the latter group showed better performance than the B.Sc. students.

It is very interesting to note that there is an order in the patterns of performance of all these groups. The B.E. students stood out best. Then came the B.E. + B.Sc. group, the whole group (B.E. + B.Sc. + B.A.), the B.Sc. Ist year and the B.A. Ist year. B.A. Ist yr. students showed the poorest performance. This is true for all the tests. The critical ratio values between the three groups B.E., B.Sc. and B.A. are all significant (table-2) beyond .01 Level.

Critical ratio however were not worked out to see whether the differences in Mean scores of the combined groups and the separate groups were significant. The reason is that, the main interest was in single separate groups. Second, in the combined groups, the constituent samples, B.E., B.Sc. and B.A. could not be maintained proportionate to their populations. So, to interpret

the differences of these combined groups, as to statistical significance, will not have much meaning.

There were no established norms, to compare the performance of our different groups of students with those norms. What all could be done was to compare the B.E. groups with B.Sc. and B.A. students; the B.Sc. group with B.E. and B.A.; and the B.A. with the two other groups, B.E. and B.Sc.

Critical ratios were worked out for the differences in mean scores of the groups (see table 2) to find out whether the differences were significant and to enable an inter-group comparison. Besides, a comparison of our groups was made with the American 12th grade boys, or American High School Graduates who served as subjects in standardisation of the Differential Aptitude Tests (DAT), and Engineering and Physical Sciences Aptitude Tests (EPSAT), respectively. Comparison with the American sample will be described in the chapter on "Side Lights".

The mean differences between the B.E. students and B.Sc. students were significant beyond .01 level in all the tests. It may be observed in table-2 that all the critical ratios are higher than 2.58, which value shows a .01 level of significance of a mean difference. The performance of the B.E. students was far better than that of the B.Sc. Ss, on all the tests, with no exception.

As there was no common scale for all the tests, the mean differences could not be compared for different tests. Yet, from the critical Ratios(C.Rs) it may be inferred that the highest difference of means(viewed in terms of S.E.) for B.E. and B.Sc. students was in Space Relations. Other tests follow in the order given below:--

Abstract Reasoning
Formulations
Mechanical Reasoning
Physical Science Comprehension
~~Comprehension~~
Verbal Reasoning
Arithmatic Reasoning.

The lowest difference was in the test on Arithmatic Reasoning. The highest C.R.(in Space Relations) is 9.15 and the lowest (in Arith. Reas.) is 2.91. The seven tests may be gouped, as below, in accordance with the degree of significance of Mean differences.*

(A) Tests with considerably high Mean differences between the B.E. and B.Sc. samples: Space Relations, Abst. Reas., Formulation, Mech.Reas. and Phy. Sc. Compre.

(B) Tests where the mean differences were not, comparatively, very high: Verb. Reas., and Arith.Reas.

One important finding may be noted here: Contrary to our assumption, that B.Sc. students would score higher than the B.E. students in Physical Sciences, Comprehension, the B.E. stuents displayed better performance.

*When the mean differences were compared, these differences were valued in terms of the respective combined Standard Error(S.E.), i.e. in terms of Critical Ratios(C.Rs.)

Comparing the B.E. group with the B.A. group, which was included in the study more as a control group(see chap. 2), it may be observed that the Mean scores of the B.E. students, on all the tests, were far higher than those of the B.A. students. The highest C.R. is 22.4 in Formulation and the lowest is 8.02 in Verb. Reas.

For six tests, the C.Rs. are, comparatively very high. These are(CRs. in brakets): Formulation (22.4), Phy.Sc. Compre. (17.5), Arith. Reas.(16.0) Abst. Reas.(16.0), Mech.Reas. (14.5), Space Relation(13.9).

The one test with comparatively low C.R is Verb.Reas. (8.02).

The following conclusions can be drawn from the above examination of the results.

(1) The performance of the B.E. students was much better on all the tests, than the B.Sc. students or B.A. students. All the Mean differences were statistically significanct beyond .01 level.

(2) The B.E. sample scored higher than the B.Sc. or B.A. sample both in the Aptitude group of tests and the Intelligence group of tests.

(3) Contrary to our expectation that the B.Sc. students would perform better on Phys. Sc. Compre. than the B.E. students, the latter showed better performance than the B.Sc. group on these tests as well as on the others. These two tests are supposed to measure scientific aptitude.

(4) The B.A. students were expected to score higher or at least ~~generally~~ equally well compared to the other groups on two of the intelligence group of tests - the Abst. Reas. and the Verb. Reas. But the findings of this study disproved this. On the other hand, the B.E. students were far superior in performance both on all of the Intelligence group of tests and ~~on the~~ aptitude group of tests.

(5) A further examination of the performance, on individual tests, revealed that the B.Sc. sample was nearer the B.E. students in the Arith. Reas. and ~~the~~ Verb. Reas. than in the other five tests.

Comparing the B.Sc. with B.A., the B.A. students were nearer, in performance, to the B.E. students in Verb. Reas. than in other six tests.

To compare the B.Sc. students with the B.A. sample, the differences, in performance, on all the tests, of these two groups were significant beyond.01 level. The highest critical ratio is 13.65 and the lowest 4.19. The B.Sc. Ss were superior to the B.A. students.

Four of the seven tests had considerably very high critical ratios: Formal: 13.65, Arith.Reas.: 11.33, Abst. Reas.: 8.65, Phys. Sc. Compre.: 8.56.

The tests with comparatively low C.Rs. are Mech.Reas. 5.20, Space Rela.: 4.32 and Verb.Reas.: 4.19. ~~The~~ Verbal Reasoning appears to have been more difficult for all the three groups, compared to other tests.

The foregoing analysis warrants, the following further conclusions, besides the observations already mentioned.

(1) Five tests, the Mech. Reas., Space Rela., Verb. Reas., Arith. Reas. and the Phy. Sc. compre. were more ~~different~~ difficult tests, in general, i.e. to all the groups, than the two other, namely, the Abst. Reas. and the Foruml. In the former tests the ratios of the mean performance scores to the maximum possible scores were much lower than in the latter two tests(Table-1).

(2) Variation within the group was considerably large in all the groups. It was greater in the Arts students than in the B.E. or B.Sc. students. In general, the lowest variation was found in the B.E. group. With regard to the tests, the highest variation was found in the Phys. Sc. Compre.

S E C T I O N B

Table-3 presents the percentile scores of the students on the seven tests. 25th, 50th, 75th and 100th percentile scores were worked out. Fractions of these socres, if any, were rounded up to the nearest scores. These scores are shown for five groups - whole group, the B.E. + B.Sc. group and the B.E., B.Sc. and the B.A. groups.

Amongst the five groups, the performance of the B.E. group was the best. The percentile score at all the four levels were highest for B.E. group compared to the other groups. No test was an exception to this. The succe-

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T A B L E -3

* Percentile values of the different groups of subjects on various tests.

PER-CENTILES		TESTS						
		Abst. Reas.	Mech. Reas.	Space Rela.	Verb. Rela.	Arith Reas.	For-mul.	Phy. Sc compre
25th:	Whole gr.	21	13	11	9	3	4	2
	B.E.&B.Sc.	25	15	14	10	3	5	2
	B.E.Ist Yr.	28	18	17	10	4	6	3
	B.Sc.Ist "	21	10	10	8	3	4	2
	B.A. Ist "	4	6	5	5	1	0	0
50th:	Whole gr.	30	21	25	12	5	7	6
	B.E.& B.Sc.	32	24	30	13	5	7	7
	B.E.Ist Yr.	35	26	35	13	6	8	8
	B.Sc. -do-	27	17	18	11	5	6	5
	B.A. -do-	11	11	12	8	2	1	0
75th:	Whole gr.	37	30	43	16	7	9	11
	B.E.&B.Sc.	38	32	47	17	7	9	12
	B.E.Ist Yr.	39	33	52	18	8	9	13
	B.Sc. -do-	33	27	39	15	6	8	10
	B.A. -do-	25	18	20	12	3	3	2
100th	Whole gr.	50	57	93	41	10	10	40
	B.E.&B.Sc.	50	57	93	41	10	10	40
	B.E.Ist Yr.	50	57	93	41	10	10	40
	B.Sc.-do-	49	55	72	36	10	10	35
	B.A. -do-	44	40	48	24	5	8	9

* Fractions of the percentile values were rounded up to the nearest score.

eding positions were occupied, respectively, by the B.E. + B.Sc. group, the " whole group", the B.Sc. and ~~the~~ B.A. groups. The performance of the B.A. group was the lowest. The same order was found in the mean scores also; and the reasons have been explained while discussing the Mean scores.

The percentile scores would not enable a discussion as to the relative difficulty of each test, to different groups. Also, the differences of the respective perentile scores of various groups could not be compared to each other with respect to the "degree of difference". The reason is, there was no common scale of score values for all the tests. And the percentile scores, on each test were only raw scores.

Notwithstanding the above limitations, a few general observations could be made from the percentile scores. The percentile scores, at all the four levels, of B.E. students, on all the tests, were higher than those of the B.Sc. group. There were only two exceptions, on Arith. Reas. and on Formul. where the 100th percentile scores of both the B.E. and B.Sc. students were the same, 10; that is the highest possible score which was reached by a few or one subject from both the groups.

The differences between the B.E, and B.A, groups were very large compared to those of the B.E. and ~~the~~ B.Sc. groups. It may be observed that, unlike the differences of the B.E. and B.Sc., the differences in the 100th per-

centile scores of the B.E. and B.A. groups were very high. This 100th percentile score of the B.A. group, on any test, was no where near that of the B.E. group. No single subject from the B.A. group scored the highest possible score.

A comparative observation of the scores of the B.Sc. and B.A. students reveals that the B.Sc. group performed better than the B.A. group. It also give an impression that the differences of the B.Sc. and B.A. groups were larger than those between the B.E. and B.Sc. groups. But Space Relation was an exception to this.

Two things were spotlighted by both the Mean scores and the percentile scores.

It was assumed that the B.A. group would perform better, or at least ~~generally~~ equally well, on Abst. Reas. and Verb. Reas., and the B.Sc. students would achieve higher scores on the Phys. Sc. compre. And on the rest of the tests, B.E. students would be superior. But this was disproved by the results. On all these tests, the B.E. students were superior to the two other groups without any exception.

The following conclusions can be drawn from the preceding discussion in Section A and B.

(1) The B.A. students, in general, scored less than the B.E. and B.Sc. groups in all the test including the general intelligence tests.

(2) The Science students had no better science aptitude than the B.E. students as they ~~showed less~~ performed poorer on the "Science aptitude tests", compared to the B.E. group.

(3) The average Engineering student had better science and Engineering aptitudes and was more intelligent also.

These conclusions should not, however, ~~completely~~ misinterpret certain ~~the~~ facts. There were some engineering students whose performance was very poor. Some science and Arts students scored definitely higher than these poor engineering students either on individual tests or groups of tests. So also, there were some Arts students who were superior to some poor science students. More about the extreme performances of individual students will come to light in the next section.

S E C T I O N C

An attempt was made to see whether there were highly atypical performances in the different groups: (1) whether there were some B.Sc. students and B.A. students who scored higher on the tests, than the average B.E. subject or some section of this sample; (2) whether there were some B.E. students who performed poorer than some of the B.Sc. sample or the average B.Sc. student; (3) Whether some B.Sc. students showed better performance than the average B.Sc. subject or some of this sample, (4) whether some subjects from B.E. group, B.E. + B.Sc. group or B.Sc. group were poorer, in their performance on the tests, than some of the B.A. group or the average B.A. subject.

In these observations, it would be attempted to see whether any tests grouped themselves together Table-4 presents the percentages of students from the B.A. group and from the B.Sc. group scoring above the Mean scores and

the Median scores of the B.E. group, on the different tests. In Arith. Reas. and Phy. Sc. Compre., no single student from the B.A. group was above the mean score of the B.E. The highest percentage of the B.A. class scoring above the Mean score of the B.E. was in the Abst. Reas.

TABLE No. 4

*Percentages of the B.A. Ss and the B.Sc. Ss. falling above the MEAN and the MEDIAN of the B.E.Group.

	Abst. Reas.	Mech. Reas.	Space Rela.	Verb. Reas.	Arith Reas.	For-mul.	Phy.Sc. Compre.
B.A. Group.							
Above the MEAN	10	7	5	11	0	2	0
Above the MEDIAN	8	7	8	17	0	2	6
B.Sc. Group.							
Above the MEAN	26	28	17	26	35	29	24
Above the MEDIAN	19	28	18	34	34	24	34

The Arith. Reas., the Phys. Sc. Compre. and the Formul. can be grouped together where either none or less than 2 percent of the B.A. group scored above the Mean score of the B.E. The other four tests Abst. Reas.(10%) Verb. Reas.(11%), Mech. Reas. (7%) and Space Rela.(5%) can be grouped together wherein there were 5 to 11% of the B.A. students who were superior to the average B.E. subject.

Regarding Median, there were 0% from the B.A. scoring above the median of the B.E. in Arith. Reas. and 17% (the highest) in the Verb. Reas. Grouping of the tests made on the basis of the Mean score holds true for the Median Scores also.

*Fractions of these percentage were rounded up to the nearest number.

The lowest percentages of B.Sc. group scoring above the Mean and above the Median scores of the B.E. group were 17% and 18% respectively in the test on Space Relations. The highest percentages of the B.Sc. students scoring above both the Mean and the Median of the B.E. were 35% and 34% respectively in Arith. Reas. On the remaining five tests, the percentages above the Mean score of the B.E. were close and ranging in the twenties. This indicates that for the B.Sc. students, it was more difficult to go beyond the average B.E. subject in the Space Relations than in the Arith Reas. With regard to the Median of the B.E. the Verb. Reas., Arith. Reas. and the Phy. Sc. Compre. had all, equal percentages(34%) of B.Sc. students scoring above it(Mdn). The Formulation (24%) and Mech. Reas.(28%) can be grouped together. The lowest percentages were in Abst. Reas. and Space Relations.

In general, the percentages of B.Sc. students scoring above the Mean and Median scores of the B.E. group were considerably high. But these were not significantly high in the case of the B.A. group.

TABLE - 5

Percentages of the B.E. Ss falling BELOW the Mean and Median scores of the B.Sc. group.

	Abst. Reas.	Mech. Reas.	Space Rela.	Verb. Reas.	Arith Reas.	For mul.	Phy.Sc. Compre.
Below the MEAN	19	27	30	44	40	26	46
Below the MEDIAN	20	24	27	31	37	27	34

Table 5 presents the percentages of the B.E. students scoring Below the Mean and Median scores of the B.Sc. students. The

lowest percentage(19%) was in Abst. Reas; and the highest (46%) was in the Phy. Sc. Compre, with regard to the Mean. In case of the Median ,the lowest percentage (20%) was in Abst. Reas. and the highest(37%) was in the Arith. Reas. Four tests - Abst. Reas., Mech. Reas., Formul. and Space Rela. may be grouped together. On these tests, the Percentages of B.E. students scoring below the Mean or Medmain of the B.Sc. students were comparatively low. On the other three tests, these percentages were considerably higher. The latter tests are Phy. Sc. Compre., Verb. Reas., and Arith. Reas.

TABLE 5(1)

* Percentages of the B.A. Ss. falling ABOVE the MEAN AND MEDIAN of the B.Sc. Group

	Abst. Reas.	Mech. Reas.	Space Rela.	Verb. Reas.	Arith Reas.	For-mul.	Phy.Sc. Compre.
Above the MEAN	22	25	23	20	2	3	9
Above the MEDIAN	19	31	30	31	2	3	15

Table 5(1) shows the percentages of B.A. students scoring above the Mean and Median scores of the B.Sc. students. The lowest percentages were in Arith Reas., Formul., and Phy. Sc. Compre. The highest were in Mech. Reas., Space Rela., Verb. Reas. and Abst. Reas., all DAT tests. The lowest percentages were 2 and 2 and the highest were 25 and 31 for the Mean and Median respectively.

No conclusion, however, could be drawn from this bunching of two groups.

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* Fractions of the percentages were rounded upto the nearest number.

TABLE - 6

Percentages of Ss from different groups falling Below the Mean, Median and 25%-tile of the B.A.group.

	Abst. Reas.	Mech. Reas.	Space Rela.	Verb. Reas.	Arith Reas.	For-mul.	Phy.Sc. Compre.
B.Sc. Group							
Below 25%tile	4	16	13	8	2	3	7
Below the Mean	14	34	37	39	9	9	35
Below the Mdn.	9	29	32	26	9	7	7
B.E.Group							
Below 25%tile	2	1	4	3	2	0	2
Below the Mean	6	11	21	22	10	2	15
Below the Medn.	5	7	17	12	10	2	2
B.Sc. + B.E. Group.							
Below 25% tile	3	6	7	4	2	1	3
Below the Mean	8	17	26	26	9	4	21
Below the Mdn.	6	14	22	16	9	3	3

Table 6 presents the percentages of students from the B.Sc. group, B.E. group and the (B.E.+B.Sc.) group scoring lower than the 25%-tile, Mean and Median scores of the B.A. group.

B.Sc. students scoring lower than the 25%tile of the B.A. group ranged from 2% in Arith. Reas. to 16% in Mech. Reas. The lowest percentage of these students scoring below the Mean of the B.A. was 9, both in Arith Reas. and Formul.; and the highest percentage was 39 in the Verb.Reas. The lowest and the highest percentages, in case of the Mdn., were 7 both in Formul. and Phys., Sc. Compre. and 32 in Space Rela. These percentages were considerably high It may be observed that the high percentages among these were concentrated especially at Mech. Reas., Space Rela., Verb. Reas. and at Ph. Sc. Compre. That is, the rest of the

tests - Arith. Reas., Formul. and Abst. Reas. - were tougher than the other tests to the B.A. students, when compared to the performance of the B.Sc. Ss.

B.E. Ss. falling below the 25% tile of the the B.A. ranged from 0% to 4%. The lowest percentage of B.E. students scoring less than the Mean score of the B.A. was 2% in Formul., and the highest was 22% in Verb. Reas. The seven tests can be grouped into three groups (1) Formul. and Abst. Reas. with low percentages, (2) Mech. Reas., Arith Reas. and Phy. Sc. Compre. with Median percentages and (3) Space Rela. and Verb. Reas. with the highest percentages. B.E. students had a greater facility in Abst. Reas. than in the other tests over B.A. students, which is against our assumption.

The percentages of the students from the (B.E.+ B.Sc.) group scoring below the Mean score of the B.A. group ranged from 4% in Formul. to 26% in Space Rela. and Verb. Reas. The pattern of grouping of the tests, on the basis of percentages, would be similar to the one with the B.E. Group.

The above discussion of the results indicates that there were some B.E. and B.Sc. students who performed very poorly compared to the average performance of the B.A. students, on the tests employed in the present study.

Another important observation was that, in most of the tests, and for all groups of students uniformly, the Mean score was higher than the Median score. This might be explained as follows. The upper 50% (or some of them) from each group scored very high as to enhance the Mean score over the Mdn.

TABLE -7

* Percentages of subjects from each group falling in the four quartiles, below and above the Mean of the whole group (B.E. + B.Sc. + B.A.)

	N	Q_1	Q_2	Q_3	Q_4	Below the Mean	Above the Mean.
Abst. Reas.							
B.E.	389	10	21	31	38	24	76
B.Sc... ..	160	25	41	22	12	53	47
B.A. -- --	129	70	17	9	4	81	19
Mech.Reas.							
B.E.	400	11	23	32	34	36	64
B.Sc.	160	35	29	17	19	65	35
B.A.	116	58	28	10	4	88	12
Space Rela.							
B.E.	360	15	20	27	38	39	61
B.Sc.	160	30	34	25	11	71	29
B.A.	111	47	33	18	2	84	16
Verb.Reas.							
B.E.	400	15	25	28	32	21	79
B.Sc.	155	31	27	23	19	66	34
B.A.	127	29	45	16	10	80	20
Arith.Reas.							
B.E.	400	17	23	30	30	41	59
B.Sc.	175	25	29	23	23	55	45
B.A.	65	72	26	2	--	98	2
Formulation							
B.E.	390	13	23	30	34	33	67
B.Sc.	177	27	37	22	14	59	41
B.A.	65	91	6	3	-	97	3
Phy.Sc. Compre.							
B.E.	360	18	22	28	32	51	49
B.Sc.	175	29	28	22	21	66	34
B.A.	65	52	34	14	-	94	6

* Fractions of the percentages were rounded up to the nearest whole number.

-: :-

TABLE -8

* Percentages of subjects from the B.E., and B.Sc. Groups falling in the four quartiles of the B.E. + B.Sc.group

	N	Q1	Q2	Q3	Q4
Abst. Reas.					
B.E.	389	18	22	28	32
B.Sc.	160	42	32	17	9
Mech. Reas.					
B.E.	400	18	24	29	29
B.Sc.	160	43	27	14	16
Space Rela.					
B.E.	360	20	24	24	32
B.Sc.	160	36	40	15	9
Verb. Reas.					
B.E.	400	20	24	27	29
B.Sc.	155	37	27	20	16
Arith. Reas.					
B.E.	400	22	24	27	27
B.Sc.	175	31	29	20	20
Formul.					
B.E.	390	19	22	28	31
B.Sc	177	38	32	18	12
Phy. Sc. Compre.					
B.E.	360	21	24	27	28
B.Sc.	175	34	27	20	19

* Fractions of these percentages were rounded up to the nearest whole number.

There are two other tables, 7 and 8. In table 7 the percentages of students from each of the B.E.,B.Sc. and B.A. groups falling in the four quartiles, and falling above ~~and~~ below the Mean score of the whole group (B.E.+B.Sc.+ B.A.) were considered. In table - 8 similarly these percentages for B.E. and B.Sc. groups in the combined B.E.+ B.Sc. group were shown. No discussion will be attempted for these tables. Because the discussion would be a repetition of the foregoing one whereas the data in the tables might be useful.

S E C T I O N - D

It was supposed that the tests employed in this study would be better predictors of the success of the B.E. and B.Sc. students in their courses, than ~~the~~ P.U.C. or 12th grade marks upon which their admission had been based. To examine this, correlations were worked out for the single tests as well as for combinations of these, with the marks the students secured in the first year examination. Then,P.U.C. marks were also correlated with the 1st Yr. examination marks. Better correlations indicate better predictive validity.

Examination marks of 68+ B.E. 1st year students, who also were included in our B.E. Ist year sample, were collected. Co-efficients of correlation of these marks with the socres of these students, on different tests, were computed. Each test was, separately, correlated with the examination marks. Then combined scores on the two following combinations of tests were also correlated with the examination marks.

1. Mech. Reas., Space Rela., Abst Reas. and Arith. Reas. as one combination.

2. Abst. Reas., Arith. Reas. and Verb. Reas as another combination.

The procedure adopted to obtain the combined scores for the above combinations of tests was to convert raw scores on individual tests, to a common scale of 100 as the Mean and 10 as the S.D. These converted (standard) scores on all the tests included in each combination were added up to get the combined score of an individual for that combination. The results are reported below:--

Test	Coeff. of correlation
Abst. Reas. with 1st year Exam. marks	+ .0017
Mech. Reas. -----do-----	+ .0006
Space Rela. -----do-----	+ .0005
Verb. Reas. -----do-----	+ .0023
Arith. Reas. -----do-----	+ .0002
Formul. -----do-----	+ .0064
Phy. Sc. Compre. -----do-----	+ .0009
Mech. Reas. + Space Rela + Abst. Reas. + Arith. Reas.) with 1st year exam. Marks.	+ .0003
Abst. Reas. + Arith. Reas. + Verb. Reas.) --do--	+.0006

It was, however, found that the test scores had very low positive correlation with the examination marks, which makes us doubt the predictive validity of these tests. However, it may be argued that the defect may be in the system of examination markings leading to

low correlations with the tests. The subjects studied in the 1st year are Mathematics, Physics and Chemistry (theory and practicals), English, Engineering Materials, and Drawing (Geometrical and Mechanical). The first four subjects are present in the P.U.C. also. As far these subjects, there is no, and should not be (expected), much difference between the P.U.C. marks and the marks in the 1st year examination in the B.E. course. Engineering Materials and Drawings are the only new subjects. The "Engineering materials" is a historical note of the origin and development of the Engineering knowledge. So a good performance in this subject even could not be taken as the sole criterion of success in the whole of engineering studies. Drawing also could not be considered as the criterion for success in the course.

The most ideal criterion to test the predictive ability of the tests could be some actual job performance. However, due to several difficulties, data on such actual performances could not be secured.

Some Important Findings:

At the end of the discussion of the results, the following important conclusions may be stated:

(1) Average performance of the B.E. students was far superior to the average performance of the B.Sc. students or the B.A. students. The former group displayed better performance than the latter two groups both on the aptitude group of tests and the intelligence group of tests.

(2) The B.E. student showed better aptitude for his course when compared to the performance of the B.Sc. or the B.A. student.

(3) The Engineering students showed better Science Aptitude than the science students, As measured through the tests of Formulation and Phy.Sc. Compre.

(4) The B.E. students were more intelligent than the B.A. students and B.Sc. students. The average scores of the former group were higher than those of the latter two groups on the three tests of Abst. Reas., Verb. Reas. and Arith. Reas. which were included as Intelligence ~~group~~ ~~of~~ tests.

(5) The average ~~of~~ performance, on all the tests, of the B.Sc. group was better than the average performance of the B.A. group.

(6) The B.Sc. students showed better science aptitude when compared to the performance of the B.A. group. But their aptitude for science should be considered poorer when compared to the B.E. Ss.

(7) The B.Sc. group scored higher on the test supposed to measure Engineering aptitude than the B.A. group. But, then, their performance was very much poorer compared to the B.E. students.

(8) On all the tests, the B.A. students achieved the ~~poor~~est Mean scores. They had the poorest Science and Engineering aptitudes and were the least Intelligent among the three groups of B.E., B.Sc. and B.A.

Though the general performances of the different groups warranted the preceding conclusions, there were some atypical performances too. There were such students in the B.A. sample who scored higher than the Mean score of the B.E. or B.Sc. students not only on the intelligence tests but on some of the aptitude tests also. So also, there were some B.Sc. students who showed better performance than the average B.E. students on the tests measuring Engineering and Science aptitudes. But, some B.Sc. students performed poorer than the average B.A. students both on the aptitude tests and the intelligence tests.

Further there were some B.E. students whose performance was poorer, compared to the average performance of the B.Sc. or B.A. group, even, on aptitude tests as well as the intelligence tests.

Thus, we find that, although, in general, most of the B.E. and B.Sc. students appear to be properly placed in their courses, there were a number of them who failed to show adequate performance on the aptitude tests.

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CHAPTER IV

EDUCATIONAL INTERESTS AND PREFERENCES

The questionnaire on Educational Interests measures the subject's interest in the present course of study from various angles such as his liking for the present course, and the various subjects of his course, and his willingness to change over to other courses. Apart from the general information data, such as the subject's age, parents' education, occupation, etc., there are thirteen questions dealing with the Educational and vocational interests. But only eight questions are included in the study, because the responses for other questions were either nil or were very few.

SECTION A

In this section, the results regarding the attitude of the students of the three groups towards their courses, in general, and towards different subjects in the courses, specifically, will be analysed and discussed.

Q.I(a) How do you like your present course of study ?

Among 297 B.E. 1st year subjects who answered the above question, 96% said they liked their course of study while 3% were indifferent and 1% disliked it. For this question, a weightage of + 1 is given to 'like', 0 to 'indifference' and -1 to 'dislike'.* Thus, their average weighted score on this question is + .96.

* The average weighted score is obtained by deducting the total No. of dislikes from one the total No. of likes or vice versa for each item and dividing the result by the total number of responses for that particular item.

Similarly, among the 110 B.Sc. subjects 71% liked their course while 17% were indifferent and 12% disliked it. Their average weighted score is +.59.

Among the 51 B.A. 1st year subjects, 91% liked their course while 7% were indifferent and 2% disliked it. Their average weighted score ~~being~~ is +.89.

Their students' interest in various subjects of their course has also been measured on a five point scale ranging from +2 to -2. An average weighted score is also obtained for each subject. The results in the individual subjects of the course are discussed below.

ENGINEERING GROUP:

Comparison of Likes for various subjects as expressed by B.E. 1st year students.

ENGLISH: Among the 261 engineering subjects who expressed their opinion 16% answered it as very interesting, 43% as interesting 28% as 'no definite reaction', 10% not interesting and 3% 'not at all interesting'. Their average weighted score is + .59.

PHYSICS: 286 students expressed their opinion regarding physics and for 52% among them it was very interesting for 40% 'interesting'. 6% answered as 'no definite reaction', 2% 'interesting' and none under 'not at all interesting'. The average weighted score is + 1.42.

CHEMISTRY: In Chemistry, 48% have answered it as very interesting among the 284 students who answered that question; For 36% it was interesting while 11% answered under 'no definite reaction'. For 4% it was not interesting and for 1% it was not at all interesting.

The average weighted score is + 1.26.

MATHEMATICS: In Mathematics, out of the 288 students who expressed their opinion 80% fall under 'very interesting', 18% under 'interesting' and 2% under 'no definite reaction', while their score is nil in the negative side. The average weighted score is +1.78.

ENGINEERING MATERIALS: 265 students responded to Engineering Materials. Among them 28% answered under 'very interesting' 42% under 'interesting' 16% under 'no definite reaction' 9% under 'not interesting' and 5% under 'not at all interesting.' The average weighted score is +.79.

DRAWING: 41% answered drawing as very interesting out of a total of 242; for 45% it was interesting while 12% had no definite reaction. For 1% it was not interesting while for 1% not at all interesting. The average weighted score is + 1.24.

A comparison of the Liking for various subjects as expressed by Engineering students shows that their most favourite subject is Mathematics(Average weighted score + 1.78). Physics occupies the next place (average weighted score + 1.42). The third in order is Chemistry(average weighted score +.1.26). The fourth is Drawing(average weighted score + 1.24). Last but one is Engineering Materials (average weighted score +.79). The last is English (average weighted score +.59).

Even the subject-wise analysis shows that the group under study(B.E. Iyear) like their course in general and also the various subjects of their study. No average weighted score is Negative. However their liking for English seems to be rather low compared to the liking for other subjects.

B.Sc. GROUP:

Comparison of Liking for various subjects as expressed by B.Sc. 1st year students.

Similar subject-wise analysis has been made for the Science group.

ENGLISH: Of the 111 students who expressed their opinion about English 33% answered it as very interesting, 50% as interesting, 11% had no definite reaction. For 5% it was not interesting and for 1% not at all interesting. The average weighted score is + 1.09 .

SECOND LANGUAGE: For 38% out of a total of 109, Second Language was very interesting; and for 39% interesting. 11% had no definite reaction, for 6% it was not interesting and for 6% it was not at all interesting. The average weighted score is +.97.

GENERAL EDUCATION: General Education was very interesting only to 6% of students in a total of 108 students who answered it. For 33% it was interesting 13% had no definite reaction while 17% and 31% answered under 'not interesting' and 'not at all interesting', respectively. The average weighted score is -.34 .

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MATHEMATICS: For 63% out of 81, Mathematics was very interesting. For 27% it was interesting while 10% had no definite reaction. There is no score on the negative side. The average weighted score is +1.53.

PHYSICS: 80 students responded to Physics out of which 47% answered it as very interesting, 39% as interesting, 9% had no definite reaction and for 5% it was not interesting. None answered under 'not at all interesting'. The average weighted score is +1.28.

CHEMISTRY: 41% answered Chemistry as very interesting out of 112 students while for 37% it was interesting. 7% had no definite reaction, while 10% and 4% answered under 'not interesting' and 'not at all interesting', respectively. The average weighted score is + 1.01.

BOTANY: Out of the 30 students who responded in Botany 40% answered it as very interesting while 60% as interesting. There was no response under any other category. The average weighted score is + 1.40.

ZOOLOGY: For 60% out of 30 students who responded to Zpplogy it was very interesting while for 40% it was interesting. The response in other categories is nil. The average weighted score is + 1.60.

Although the opinion of B.Sc. students about their course in general is positive, among the eight subjects of ~~their~~ their course assessed individually one has a negative score of -.34.

The subject-wise analysis shows that the first place is taken by Zoology (average weighted score +1.60) which indicates that it is the most favourite subject of the group.

under study(i.e. B.Sc. 1st year).Mathematics occupies the next place(average weighted score +1.53). The third place is taken by Botany(average weighted score +1.40). Physics comes fourth in order(average weighted score +1.28). English occupies the fifth place(average weighted score +1.09). Then comes Chemistry in the sixth place (average weighted score + 1.01). Second Language occupies the seventh place(average weighted score +.97). The last in order comes General Education(average weighted score -.34).

The significant point that is revealed in the subject-wise analysis is that General Education has got a negative average weighted score, which indicates that it is not liked by majority of the students.

ARTS GROUP:

Comparison of Likes for various subjects as expressed by Arts Students.

ENGLISH: In Arts group out of the 60 students who responded to English 42% answered it as very interesting, 43% as Interesting, 13% had no definite reaction,and 2% as not interesting. The response under the 'not at all interesting' is nil. The average weighted score is +1.24.

SECOND LANGUAGE: 61 students responded to Second Language and out of that 61% said it is very interesting and 32% as interesting 3% had no definite reaction and for 3% it was not interesting. The response under 'not at all interesting' is nil. The average weighted score is +1.52.

GENERAL EDUCATION: For 20% General Education was very interesting out of a total of 60,for 33% it was interesting. 15% had no definite reaction, for 13% it was not interesting.

and for 19% it was not at all interesting. The average weighted score is + .22

ECONOMICS: In Economics 50% out of a total of 50 who answered it as very interesting, 40% as interesting, 4% had no definite reaction for 4% it was not interesting and for 2% it was not at all interesting. The average weighted score is +1.32.

POLITICAL SCIENCE: 38% answered Political Science as very interesting out of a total of 60 students while 47% responded to it as interesting. 10% had no definite reaction. For 3% it was not interesting and for 2% it was not at all interesting. The average weighted score is +1.16.

PUBLIC ADMINISTRATION: For 60% Administration was very interesting out of 25 students while for 32% it was interesting. 8% had no definite reaction. The average weighted score is + 1.25.

TELUGU (Optional): Out of the 23 students who responded to Telugu(optional) 74% said it is very interesting, 22% as interesting and 4% had No definite reaction. The average weighted score is + 1.66

HISTORY: History was very interesting to 73% while it was interesting to 27%. The response under other categories is nil. The average weighted score is + 1.73.

ENGLISH:(Optional): English as optional is very interesting to 67% out of a total of 6 students who responded while it was interesting to 33%. The response is nil under other categories. The average weighted score is + 1.67.

The rank order of the various subjects liked by the B.A. 1st year students is as follows:

First is History with an average weighted score of + 1.73, English(optional) second with an average score of + 1.67. The third place is taken by Telugu(optional) with an average score of * 1.66 . The fourth place is occupied by two subjects namely Public Administration and Second Language(in general) with an average score of * 1.52, Economics comes fifth with an average score of + 1.32. Sixth is English(General) with an average score of + 1.24. Last but one in the order is Political Science with an average score of + 1.16. The last i.e. eighth is Genderal Education with an average score of + .22 .

English(General) is a common subject for all the three groups under study. It is liked more by the Arts students(average weighted score +1.24) and then the Science students(average weighted score + 1.09) and the Engineering students(average weighted score +.59).

Second Language which is a common subject for Arts and Science students is liked more by Arts students(average weighted score + 1.52) than by Science students (average weighted score +.97).

General Education, which is common subject both for the Arts and Science students, is liked by Arts students alone(average weighted score + .22) while it is disliked by Science students(average weighted score -.34).

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SECTION B.

In this section the discussion pertains to the problems of selection of courses, ages at the time of selection, desire for courses other than one's own, etc.

B.E. 1st YEAR GROUP:

Out of a total of 301 Ss who responded to a question* regarding choice of course of study, 290 students said that they had chosen the course on their own choice, while the remaining 11 students chose their course for various other considerations. Out of the 290 students who answered affirmatively in the above case 267 students have given their age. 6% of them fall in the age group of 10 years and below. 15% between 11 years and 12 years, 22% between 13 and 14 years and 42% between 15 and 16 years. 12% between 17 and 18 years and 3% between 19 and 20 years.

Five students who said they have chosen on their own choice also reported the suggestion by others also. Thus, in all 16 students(instead of 11) have reported that others have influenced their choice. Out of these 16 students 6 students attribute their choice to the influence of their parents one subject to his Teachers, 3 students to this Brothers and Sisters, 2 students to this Friends, 1 student to the Advertisements and 3 students to various other reasons which does not fall under any of the above catagories.

Out of the 11 students who did not choose their course on their own choice, 2 students said they would have chosen other courses if they had been given free

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* Question: Did you choose your present course on your own(choice) ?

choice at the time of joining while 6 students denied any such possibility.

In response to a question* concerning change over to other courses, out of a total 283 students only 6% said they were willing to change over to other courses now, while 94% were not willing for any change. Of the 17 students who were willing to change over to other courses, 9 were opting for Medicine, 2 for Technology, 3 for Aeronautics, 1 for Arts, 1 for Science and one was preferring to go in Merchant Navy.

B.Sc. GROUP:

In the Science group, in a total of 115, 93 students said they have chosen their course on their own choice while 22 students attributed it to other influences.

Of 93 students only 75 students have given their ages at the time of selecting. The percentages of Ss in various age groups are as follows:- 10 years and below 1%, 4% between 11 and 12 years, 15% between 13 and 14 years, 45% Between 15 and 16 years 26% between 17 and 18 years, 5% between 19 and 20 years and 3% above 20 years.

One subject who chose the course on his own also attributed the influence of others on his choice. Thus, in all, 23 students (instead of 22 students) have given various reasons for chosing their present course. 11 students attributed their choice to the influence and suggestion of their Parents, 4 students to their Brothers and sisters 4 to their Friends ~~to~~ students to certain other reasons not mentioned above.

* Q. If you are allowed to choose your course of study now without involving any loss of years or other facilities, would you like to change over to any other course ?

18 students said they would have chosen other course if they had been given free choice at the time of joining while one subject denied any such possibility.

Among the 112 students who responded 67% said they are willing to change over to other courses now while 33% had no such willingness. Of the 67%, 56 students were opting for Engineering course, 1 student for Technology 1 subject for Arts, 14 subjects for Medicine and 2 subjects for Agricultural Science.

B.A. GROUP

In the Arts Group out of the total of 61 students 56 students(92%) have chosen their course on their own choice while 5 students(8%) chose their course for various reasons.

Only 49 students out of 56 who chose their course on their own choice have given their age at the time of joining and their age-groups are as follows:- 8% between 13-14 years, 35% between 15-16 years, 41% between 17-18 Yrs. 14% between 19-20 yeafs and 2% above 20 years.

11 students who have chosen their course on their own choice have also attributed the influence of others on their choice. Thus 16 students(instead of 5) have given various reasons for choosing their present course. 6 students attributed their choice to the influence and suggestion of their Parents, 3 students to their teachers 2 students to their Brothers and Sisters and 5 students to their Friends.

5 students said they would have chosen other course if they were given free choice at the time of joining while 1 subject denied any such possibility.

9 students (16%) out of the total of 56 students said they are willing to change over to other course now, while 47 students (84%) are not willing.

Out of the 9 students who are willing to change over to other courses now 3 have opted for Medicine, 4 for Science and 2 for Home Science.

The group with Botany and Zoology as their subjects has not been included in our study. But it is taken only for comparison. They study neither Mathematics nor Physics. The only common subject of the group is Chemistry. A comparison between Maths group and Biology group as to their liking for chemistry would be ideal; but this is not done at present.

SECTION C

AN OVERALL COMPARISON OF THE THREE GROUPS OF STUDENTS

(1). Among the three groups the Engineering students like their course more than the other two groups like their own courses.

	B.E.	B.Sc.	B.A.
Average weighted score	+ .95	+ .59	+ .89

(2) Nearly half of the Science students chose their course without a positive liking for it.

(3). The Engineering students decide on their future course of study at a much earlier age than Science and Arts students. The table below shows the ages at which

different percentages of the three groups decided to pursue their respective courses.

ENGINEERING STUDENTS	Between	10 years and below	6%
		11-12 years	15%
		13-14 years	22%
Total %age deciding on the course before 14 years of age.			43%
%age deciding after 14 years of age			57%

SCIENCE STUDENTS:	Between	10 years and below	1%
		11-12 years	4%
		13-14 years	15%
Total %age decideing on the course before 14 years of age			20%
%age deciding after 14 years of age			80%

ARTS STUDENTS:	Between	10 years and below	0%
		11-12 years	0%
		13-14 years	8%
Total %age deciding on the course before 14 years of age			8%
%age deciding after 14 years of age			92%

This clearly shows that Engineering students decide their future course of the study quite at an early age. The next is the Science and the last is Arts group.

(4). The Science students are more inclined to change their course of study than the Engineering or Arts students

The percentages in the three groups who are willing to change their course.	
Science group	67%
Engineering Group	6%
Arts Group	9%

(5) The above figures also show that the Arts students, although they do not have a job security, are less inclined to change their course of study. This is probably because, of the system (of education) where Arts students have no way of changing over to science course or professional course. The only alternative is other Arts Courses.

(6) The high percentage of students who are not willing for a change among the Engineering group could be attributed to the course being professional and the fact that they have have job security, atleast, at the present juncture.

Table showing the average weighted scores for each group and for their respective subjects.

B.E.

English	Physics	Chemistry	Maths	Engineering Material	Drawing.
+.59	+1.42	+ 1.26	+1.78	+ .79	+1.24

B.Sc.

Engl.	S.L.	G.E.	Maths.	Phys.	Chem.	Bot.	Zool.
+1.09	+.97	+.34	+1.53	+ 1.28	+ 1.01	+ 1.40	+ 1.60

B.A.

Engl.	S.L.	G.E.	Econ.	Pol.Sc.	Pub.Admn.	Tel.	Hist.	Engl. Opt.
+1.24	+1.52	+.22	+1.32	+ 1.16	+ 1.25	+1.66	+1.73	+1.67

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SUMMARY OF THE FINDINGS

Taking into consideration all the three groups under study it could be said that all of them like their course in general. Not only their responses to the question which asks whether they like their present course reveal this fact but also their responses as to their liking or disliking for the various subjects of their course. With a very few exceptions almost all of them have positive average weighted scores.

The degree of liking for their course of study idffers from faculty to faculty. This study reveals that Engineering students like their course more than Arts or Science students. Arts students are next to Engineering students. Third is the Science students group.

About 90% of the total sample have chosen their course of study on their own choice. Hence, whatever the problems that may arise, the student is directly responsible for them, that is, in 90% of cases, nobody forced the candidate to make such and such a choice.

A large majority of the students do not make their educational choice at a time when they ought to have made one. For instance, their future line of higher study largely depends upon the electives they choose for their higher secondary examination. The approximate average age of the pupil going to this examination is 16 years. Hence, the electives must be chosen between the dandidate's 13th and 14th years. But the present study reveals that the

-: 71 :-

number of subjects who made this decision at or below the age of 14 years for the whole group is about 24% only which indicates that about 76% of them do not make a decision when they are required to make.

Among the three groups more of the subjects going to Engineering course have made such a decision than the subject going to Science or Arts. (14 years and below Engg.: 43%, Sc.: 20% ,and Arts: 8%).

Except the Science group the majority of subjects in the remaining two groups are not willing to change over to any other course. The Science students are inclined to take-up Engineering or Similar course.

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CHAPTER V

VOCATIONAL INTERESTS

Altogether there are twenty two vocational areas which were included in the present Vocational Interest Blank. This Vocational Interest Blank has been administered, commonly, to all the three groups, viz. B.E., B.Sc. and B.A. 1st year students. The following are the 22 areas which were measured:
(1) Administrative (2) Arts (3) Biological (4) Chemical (5) Clerical (6) Defence (7) Diplomatic and Foreign Service (8) Engineering (9) Entrepreneaur (10) Medical and Health (11) Handicrafts (12) Legal (13) Literary (14) Farming (15) Physical Science (16) Protective (17) Public Life (18) Public Relations (19) Selling (20) Social Sciences (21) Teaching (22) Welfare.

The students in the first year of the three faculties expressed their 'Likes', Indifference or 'Dislike' towards various items in each area. A weightage of +1 is given to Like, 0 to Indifference and -1 to Dislike. An average weighted score is obtained for each vocational area by deducting the number of dislikes from the number of likes or vice versa, whichever is higher, and dividing the result by the number of responses in that particular area. Tables 9 and 10 present the results.

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SECTION A

VOCATIONAL INTERESTS OF THE ENGINEERING STUDENTS

There are 900 responses in the 'Administrative' area by the Engineering students, among whom 57% liked it, 17% disliked while 26% were indifferent. Their average weighted score is +.40 .

Out of 1095 responses under Arts 46% were for like, 24% for dislike while 30% were for indifference. Their average weighted score is +.22 .

Among 1201 responses under 'Biological', 26% were for like, 38% were for dislike, while 36% were for indifference. The average weighted score is -.12 .

There were 900 responses under 'Chemical' among whom 61% liked, 15% disliked while 24% were indifferent. The average weighted score is +.46 .

Under 'Clerical' 49% were for like, out of a total of 1194, while 19% were for dislike and 32% for indifference. The average weighted score is +.30 .

There are 2310 responses under 'Defence' among which 57% were likes, 13% dislikes and 30% indifference. The average weighted score is +.44.

Under 'Diplomatic and Foreign service' were 1188 responses among which 58% were likes, 17% were dislikes, 25% were indifference. The average weighted score is+.41.

There are 73% likes in 'Engineering' out of a total of 3576, while dislikes are 8% and indifferences 19%. The average weighted score is #+.65 .

'Entrepreneaur' has 34% of likes, 28% dislikes and 38% indifferences out of total of 898. The average weighted score is +.06 .

'Farming' has 46% likes, 20% dislikes and 34% indifferences, out of a total of 896. The average weighted score is +.26 .

Under 'Handicrafts' there are 1184 responses among which 39% are likes, 24% are dislikes, and 37% indifferences. The average weighted score is +.15.

1199 subjects have responded to 'Legal' out of which 45% are likes, 20% dislikes and 35% indifferences. The average weighted score is +.25 .

Out of 1192 responses under 'Literary' area 52% are likes, 18% dislikes, and 30% are indifferences. The average weighted score is +.34 .

There were 1176 responses under 'Medical and Health' out of which 44% are likes 19% are dislikes, and 37% are indifferences. The average weighted score is +.25 .

Out of 1186 responses under 'Physical Sciences' area 66% are likes, 10% dislikes, and 24% are indifferences. The average weighted score is +.56 .

Under the 'Protective' there are 1189 responses, out of which there are 44% likes, 28% dislikes and 28% indifferences. The average weighted score is +.16 .

1193 subjects have responded under the area 'Public Life', out of which 23% were likes, 46% were dislikes, and 31% were indifferences. The average weighted score is -.23.

Out of 1188 responses under 'Public Relations' 39% were likes, 22% were dislikes, and 39% were indifferences. The average weighted score is +.17 .

The likes under the area of 'Selling' are 29% while dislikes are 33% and indifferences 38% out of total of 1182. The average weighted score is -.04.

There are 1485 responses under 'Social Sciences' out of which 49% are likes, 17% dislikes and 34% are indiffere ences. The average weighted score is +.32.

The 'Teaching' has 1143 responses of which 50% are likes, 18% are dislikes and 32% are indifferences. The average weighted score is +.32 .

Under the area of 'Welfare' there are 1197 responses out of which 56% are likes, 13% dislikes and 31% indif-ferences. The average weighted score is +.43.

The first rank goes, as it may sound abvious, to the Engineering A rea with an average weighted score of +.65

The second place is taken by 'Physical Sciences' with an average weighted score of +.56. The third rank is of 'Chemical' with an average weighted score of +.46. Fourth

is 'Defence' with an average weighted score of +.44. Fifth is 'Welfare' with an average weighted score of+.43. Sixth 'Diplomatic and Foreign Service' with an average weighted score of +.41, seventh, 'Administrative' with an average weighted score of +.40, eight is 'Literary' with an average weighted score of +.34. Rank 9.5 is occupied by two areas namely 'Social Science' and 'Teaching' with average weighted score of +.32.

Rank 11 goes to 'Clerical' with an average weighted score of +.30. Farming is twelfth with an average weighted score of +.26. Rank 13.5 is occupied by two areas namely 'Legal', and 'Medical and Health' with an average weighted score of +.25 each.

Fifteenth rank goes to 'Arts' with an average weighted score of +.22.

'Public Relations' is sixteenth with an average weighted score of +.17.

(Protective' is seventeenth with an average weighted score of +.16.

Rank eighteenth goes to 'Handicrafts' with an average weighted score of +.15. The area of Entrepreneaur takes ninteenth place with an average weighted score of +.06. The twentieth rank is taken by the area of Selling with an average weighted score of -.04.

Then comes 'Biology' in the twentyfirst place with an average weighted score of -.12. The last in order is 'Public Life' in the twenty second place with an average weighted score of -.23.

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SECTION B

VOCATIONAL INTERESTS OF THE SCIENCE STUDENTS

There are 340 responses under 'Administrative' of which 50% are likes, 25% are dislikes and 25% are indifferences. The average weighted score is +.25.

The total responses under 'Arts' are 577 out of which 45% are likes, 29% dislikes, and 26% are indifferences. The average weighted score is +.16.

The area of 'Biology' has 462 responses of which 33% are likes, 36% dislikes, 31% are indifferences. The average weighted score is -.03.

The responses under 'Chemical' area are 354 out of which 63% are likes, 15% dislikes and 22% indifferences. The average weighted score is +.41.

Out of a total of 452 responses in 'Clerical' area, likes are 47% dislikes 22% and indifferences are 31%. The average weighted score is +.25.

There are 903 responses under the area of 'Defence' of which 51% were likes, dislikes are 18% and 31% indifferences. The average weighted score is +.33.

The total responses under 'Diplomatic and Foreign Service' are 472 out of which 60% are likes, 19% dislikes, and 21% are indifferences. The average weighted score is +.41.

Out of a total 1365 responses under 'Engineering' 61% are likes, 19% dislikes, and 20% indifferences. The average weighted score is +.42.

Under 'Entrepreneaur there are 333 responses of which 37% are likes, 29% dislikes and 34% indifferences. The average weighted score is +.08.

'Farming' has 356 responses of which 43% likes, 29% dislikes, and 28% indifferences. The average weighted score is .14.

The total responses under 'Handicrafts' are 455 of which 36% are likes, 31% dislikes and 33% indifferences. The average weighted score is +.05.

Out of a total of 454 responses under 'Legal' 46% are likes, 24% dislikes and 30% indifferences. The average weighted score is +.22.

'Literary' area has a total of 459 responses of which likes are 56%, dislikes 16% and indifferences 28%. The average weighted score is +.40.

There are 452 responses under 'Medical & Health' of which 43% are likes, 20% dislikes and 37% indifferences. The average weighted score is +.23.

'Physical Science' has 462 responses in all, of which 63% are likes, 16% dislikes and 21% indifferences. The average weighted score is +.47.

Under 'Protective' likes are 42% out of 358, while dislikes are 33% and indifferences 25%. The average weighted score is +.09.

There are 454 responses under 'Public Life' out of which 26% are likes, 46% dislikes and 28% indifferences. The average weighted score is -.20.

Out of a total 452 responses under 'Public Relations' 46% are likes, 24% dislikes and 30% indifferences. The average weighted score is +.22.

Under the area of 'Selling' the total responses are 461 of which 36% are likes, 35% dislikes, and 29% indifferences. The average weighted score is +.01.

'Social Science' has a total responses of 572 of which 48% are likes, and 23% dislikes and 29% indifferences. The average weighted score is +.25.

The total responses under the area of 'Teaching' are 455 of which 52% are likes, 19% dislikes, and 29% indifferences. The average weighted score is +.33.

Out of 461 responses in the area of the 'Welfare', 51% are likes, 16% dislikes and 33% indifferences. The average weighted score is +.35.

In the G.Sc. group the first rank goes to the 'Physical Science' area with an average weighted score of .47. It means this area was liked by this group above all other areas.

The second is 'Engineering' with an average weighted score of +.42. The rank 3.5 is taken by two areas namely Chemical,& Diplomatic & Foreign Service with an average weighted score of +.41 each. The rank 5 is taken by Literary area with an average weighted score of +.40.

Welfare occupied the sixth position with an average score of +.35. A rank of 7.5 goes to both to 'Defence' and 'Teaching' with an average weighted score of +.33 each.

-: 80 :-

A rank of 10 goes to three areas namely 'Administrative, 'Clerical' and 'Social Scieness' with an average weighted score of +.25 each.

'Medical and Health' takes 12th with an average weighted score of +.23. Next come two areas namely, 'Legal' and 'Public Relations ' with an average weighted score of +.22 each and with a rank of 13.5

Fifteenth is the area of "Arts" with an average weighted score of +.16. Sixteenth rank goes to Farming with an average weighted score of +.14. Seventeenth is Protective with an average weighted score of +.09.

Entrepreneaur occupies eighteenth position with an average weighted score of +.08. Nineteenth is Handicrafts with an average score of +.05. Selling takes twentieth position with an average weighted score of +.01.

Last but one is 'Biology' with an average weighted score of -.03.

The last one is 'Public Life' with an average weighted score of -.20.

SECTION C

VOCATIONAL INTERESTS OF THE ARTS STUDENTS

In Administrative area the total responeses are 169 for the Arts group, out of which 46% are likes, 23% dislikes and 31% indifferences. Their average weighted score is +.23.

-: 81 :-

Out of 293 responses under the area of 'Arts' likes are 62%, dislikes 23% and indifferences 15%. Their average weighted score is +.39.

There are 246 responses under 'Biology' of which 43% are likes, 22% dislikes and 35% indifferences. The average weighted score is +.21.

In Chemical area the total responses 176 of which 43% are likes, 23% dislikes and 34% indifferences. The average weighted score is +.20.

Out of 233 responses in 'Clerical' 51% are likes, 21% dislikes and 28% indifferences. The average weighted score is +.30.

There are 468 responses under Defence of which 42% are likes, 26% dislikes, and 32% indifferences. The average weighted score is +.16.

In the area of Diplomatic & Foreign Service the total responses are 234 of which 50% are likes, 21% dislikes, and 29% indifferences. The average weighted score is +.29.

Out of 711 responses in 'Engineering' 34% are likes, 31% dislikes and 35% indifferences. The average weighted score is +.03.

There are 183 responses under Entrepreneur area of which 36% are likes, 28% dislikes and 36% indifferences. The average weighted score is +.08.

Farming has a total responses of 182 of which 62% are likes, 11% dislikes and 27% indifferences. The average weighted score is +.51.

In Handicrafts the total responses are 241 out of which 49% are likes, 28% dislikes and 23% indifferences. The average weighted score is+.21.

Out of 240 responses under the 'Legal' area 57% are likes, 13% dislikes and 25% indifferences. The average weighted score is +.39.

There are 236 responses under Literary area of which 66% are likes, 11% dislkes and 23% indifferences. The average weighted score is +.55. ,

'Medical and Health' has 235 responses in all, out of which 42% are likes, 21% dislikes and 37% indifferences. The average weighted score is +.21.

In 'Physical Sciences' area there are 237 responses of which 38% are likes, 30% dislikes and 32% indifferences. The average weighted score is +.08.

In 'Protective' 39% are likes, 35% dislikes and 26% indifferences out of a total of 236. The average weighted score is +.04.

There are 234 responses under the area of 'Public Life' of which 48 are likes, 28% dislikes and 23% indifferences. The average weighted score is +.19.

Public Relations has 237 responses in all, out of which 67% are likes, 16% are dislikes and 17% indifferences. The average weightad score is +.51.

In Selling the total number of responses are 294 of which 58% are likes, 13% are dislikes and 29% indifferences. The average weighted score is +.45.

Out of 234 responses under 'Social Sciences' area 45% are likes, 23% dislikes and 32% indifferences. The average weighted score is +.22.

There are 237 responses in all under Teaching, of which 60% are likes, 16% are dislikes and 24% indifferences. The average weighted score is +.44.

'Welfare' has 243 responses out of which 57% are likes 18% dislikes and 25% indifferences. The average weighted score is +.39.

In this group the first rank goes to the Literary area with an average wieghted score of +.55. This indicates that it is liked more than any other area under study.

A rank of 2.5 is taken by two areas namely Farming and Public Relations with an average weighted score of +.55 each.

The fourth place goes to Selling with an average weighted score of +.45. Teaching takes fifth place with an average weighted score of +.44. Three areas namely A rts, Legal and Welfare get a rank of 7 with an average weighted score of +.39 each.

'Clerical' takes the nineth rank with an average weighted score of +.30. Tenth is 'Diplomatic and Foreign Service' with an average weighted score of +.29.

Administrative takes eleventh place with an average weighted score of +.23.

Twelfth place is taken by Social Sciences with an average weighted score of +.22. A rank of 14 is credited to three areas namely Biological, Handicrafts and 'Medical

& Health' with an average weighted score of +.21 each.

Chemical is sixteenth with an average weighted score of +.20.

Public Life is seventeenth with an average weighted score of +.19.

Eighteenth place goes to Defence with an average weighted score of +.16.

A rank of 19.5 goes to two areas namely Entreprenaur, and Physical Sciences with an average weighted score of +.08. each. Protective takes 21st rank with an average weighted score of +.04.

The last is Engineering with an average weighted score of +.03.

SECTION D

A COMPARISON OF THE THREE GROUPS

In the above sections the patterns of vocational interests expressed by the three groups of Ss have been discussed. In general, it was found that the Engineering and Science students expressed preferences which are generally in line with their courses of study pursued. This point, however, can be made clearer by the tables 11 and 12, where the most and the least preferred vocations by these three groups are presented, in rank order.

From the tables(11 & 12), we find for the Engineering group the highest preferred area is Engineering followed by Physical Sciences, and then by Chemical Sciences. This

order, perhaps is in the expected direction. However, the average wieghted score for the second ranking area of Physical Sciences is not very much lower than the area of Engineering. Considerable number have also expressed preference for completely unrelated areas like Welfare, Diplomatic and Foreign service, etc. Thus, it is found that vocations unrelated to the course of study also get considerable average scores. Again, looking into the last three areas, Selling and Entrepreneaur could have been expected to fare better with the B.E. group. Sales engineer is an occupation with considerable scope for students of engineering.

Considering the B.Sc. group, it is found that the preference for engineering occupation is almost equal to the first ranking, Physical Science. Thus, the Science group seems to be showing a greater preference for Engineering than the engineering group for Physical Science. Diplomatic and Foreign service again ranks high for the B.Sc. group. Surprisingly, Literary and Welfare jobs also rank high. One is surprised that these three areas which are in no way connected with the courses of study pursued by these students should get such high preferences.

In considering the responses of the B.A. group, of course, it is not possible to expect them to show characteristic preferences like the other two groups. Still it is surprising how Farming gets the second place, though other areas like Public Relations, Teaching, etc., are more related to the courses pursued. Administrative

jobs which are most suited for the B.A. group do not figure among the first six. Thus, the preference pattern of B.A. students appears to be least congruous with the courses pursued.

On the whole, the findings appear to suggest the following conclusions:--

(1). Both the B.E. and B.Sc. groups, to a large extent, express preferences for vocational areas connected with their courses of study.

(2). However, vocational areas not related to the courses of study are also mentioned by a considerable number. It is surprising that areas like Diplomatic & Foreign service, and Welfare should find high preference values among science and engineering students.

(3). When we come to the Arts group, we find that areas like literary and Farming get the highest preferences and administrative jobs do not get prominence.

(4). On the whole, the picture revealed is not completely satisfactory. Either there is a lack of correspondance between the genuine vocational preferences of the Ss and their courses of study, or it is possible that these Ss have not developed a sense of vocational maturity. In the farmer case, it may be concluded that they are in the wrong courses; in the latter instance, they must be provided with proper vocational education along with their academic training.

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SECTION E

VOCATIONAL PREFERENCE PATTERNS OF STUDENTS WITH HIGH APTITUDE & LOW APTITUDE

It was felt that it might be interesting to compare the vocational interest patterns of students with high degree of aptitude and students with low aptitude. This might throw some light on the relationship between the aptitude and expressed interests of our Ss. However, this analysis could not be extended to all the groups. For many from the science and arts groups, had not filled up the vocational interest blank. Further, many of them had not taken all the aptitude tests either, for the reasons already stated. It was only the engineering group in which all the Ss had taken all the tests as well as the interest blank.

For the purpose of comparison, the scores of the Ss of the engineering group from the Regional Engineering College, Warangal(standard scores with a mean of 100 and S.D. of 10) on all the tests were added up. The analysis was restricted to the Warangal group, because the standard scores had already been determined for this group for establishing correlations with first year examination marks. The 10 Ss securing the highest aggregate scores were selected as the 'high group' and the 10 Ss securing the lowest were selected as the 'low group.' A comparison of the vocational interest patterns of these two groups is attempted.

Table 13 gives the results.

One striking feature that is revealed in the table is that, in the high scoring group 82% expressed their like for Engineering field while only 62% liked it from the low scoring group. The percentage of 'dislike' is also higher for low scoring group which is 17 as against 3 for high scoring group. Their average weighted scores are .79 and .45 for high scoring and low scoring groups, respectively.

In the administrative area, the high scoring group has a positive score of .67(likes 77%, dislikes 10%). This is contrary to our assumption. Because a subject with a high aptitude for engineering should not normally prefer an administrative job. Hence, for the high scoring group the dislike score should have been higher than the like score.

In the Biological area also, the high scoring group has an average weighted score of .09 with 37% likes and 28% dislikes. As in the case of Administrative area, here also, the dislike score should have been more than the like score, i.e. the average weighted score should have been negative. On the other hand, low scoring group has an average weighted score of -.13. This may or may not be possible. But keeping the score of high scoring group in view it may be said that this score should have been positive.

In the Entrepreneaur area too, the high scoring group has an average weighted score of .23 with 40% likes and 17% dislikes. A positive response in this field is indicative of the subject's desire to start something of their own.

But a person having a high aptitude score in engineering is very unlikely to start some business or establish concern on his own but would go further in his own line.

Similarly, 80% liked Diplomatic and Foreign service in the high scoring group while 5% disliked it. Something could be said about this area also. The percentage of 'dislike' should have been higher for the high scoring group while the percentage of 'likes' should have been higher for the low scoring group. So also in the area of Handicrafts. The dislike score is 10% for high scoring group which should have been at least more than 50%.

In the area of Public Relations also the average weighted score is +.28 with 48% likes and 20% dislikes. The low scoring group has an average weighted score of .07 with 32% likes and 25% dislikes. The score of the low group should have been more on the positive side.

Even in the area of Teaching the high scoring group has an average weighted score of .46 with 58% likes and 12 dislikes. The low scoring group has an average weighted scoreof .20 with 46% likes and 26% dislikes. The average weighted score of the high scoring group should have been less, if not negative, than the average weighted score of the low scoring group.

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CHAPTER VI

SOME SIDE LIGHTS

In the preceding chapters, throughout, the emphasis has, been on a comparison of the B.E. Ist year, ~~and the~~ B.Sc. and B.A. Ist year among themselves individually, and occassionally in combinations. In this chapter, the results regarding the comparative performances of these freshman groups on the one hand with successful and experienced groups on the other are discussed and presented. As already mentioned, a group of B.E. final year students, a group of B.Sc. final students, a group of M.Sc. students and a group of professionals comprising of Engineers and Research Scholars were also tested. No final year group or professional group from the Arts side was included as the B.A. 1st year students themselves were included as control group. The comparison of the freshmen groups with the successful groups might throw some light on the validity of the tests employed. The criterion of success employed here, at least for the Engineering group, may be more appropriate than the first year examination marks already considered.

In addition to attempting these comparisons, in this chapter, an attemp would also be made to compare the performance of our (Indian) subjects with the performance of American 12th grade pupils. The American 12th grade students are

more or less comparable to our, i.e. Indian freshman groups from the point of view of the years of schooling, age level, etc. One point which must be mentioned, with regard to the American norms considered, is as follows:

The performances compared are those of the American 12th grade children only in the case of four subtests selected from the DAT, namely, Abstract Reasoning, Mechanical Reasoning, Space Relations and Verbal Reasoning. In the case of other three subtests drawn from the EPSAT the norms considered relate to performance of American High School Graduates admitted into an Introductory Engineering Course in Pennsylvania State College, U.S.A. These data were taken from the DAT and EPSAT manuals, respectively, for the two groups.

The tables below (14&15) present the results:

TABLE 15

Critical Ratios for Differences of Mean scores Between Different 1st year students and Senior students, Research Scholars & Engineers And American 12th Grade Boys.

Test.	B.Ec. & B.E. (Final	B.Sc. I & B.Sc. Final	B.Sc. I & M.Sc. Final	B.E. (F) & Res. Sch. Enginr.	B.E. 1st. & American 12 grade.
Abst. Reas. ..	7.65	1.97	0.30	0.94+	3.34+
Mech. Reas. ..	14.79	1.40	2.57	1.34+	34.68
Space Rela. ..	10.22	4.25	1.95	0.32+	15.58
Verb. Reas. ..	9.71	2.49	2.46	2.38	37.32
Arith. Reas. ..	11.70	0.99+	0.25	1.17	7.24
Formulation ..	11.47	2.66	2.37	1.13	10.08+
Phy. Sc. Compre...	12.30	0.03+	3.54	1.52	4.29

Part I: Comparison of the B.E.1st year, B.Sc.1st year and B.A. 1st year groups with successful Indian subjects.

Tables 14 and 15 show the mean performances, standard deviations and the critical ratios of the differences on the various tests. From the tables, it is found that, on the whole, the four successful groups do better on all the tests compared to the freshmen groups. Considering the performances of the whole group of freshmen, it is found that, all the successful groups score higher in Abstract Reasoning than the freshmen group. The only exception is the M.Sc. final group which scores 26.39 as against 27.56 of the freshmen groups. The difference is negligible. In the test on Mechanical Reasoning, again, the successful groups score higher than the whole freshmen group, excepting for the B.Sc. final group, which has an average score of 21.18 as opposed to 21.99 of the freshman group. In the case of Space Relations and Verbal Reasoning, all the four successful groups, again, score higher than the freshmen group. In Arith. Reas., the only exception to this rule is the B.Sc. Final group which shows a slightly low average than the freshmen group. In Formulation also, all the four successful groups score higher than the Freshmen group, while in physical Science Comprehension, the B.Sc. final group shows an insignificantly lower average than the freshmen group. Thus, on the whole, it is found that, the four successful group have shown higher scores on all the tests compared to the freshman group as a whole.

Part II: Comparison of Specific Freshmen groups with Specific Successful Groups:

Comparing the B.E. 1st year group with B.E. final group, it is found that, in all the tests, the B.E. final year group has scored significantly higher; and the critical ratios of differences between these two groups are all highly significant, thus showing the capability of the tests to differentiate between these two groups.

Comparing the B.Sc. 1st year and the B.Sc. final, it is found that, in all the tests, excepting Arith. Reas. and Phy.Sc. Compre. the final year group has scored higher. In these two tests, the 1st year group scores slightly higher. The critical Ratio values show a clear significance of differences between these two groups, in favour of the final year group.

Comparing the B.Sc. 1st year and the M.Sc. final, the latter group shows higher scores in all the tests, excepting Arith. Reas., where the B.Sc. 1st year group shows a negligibly higher average. The table of critical ratios shows significant differences in favour of the M.Sc.group, in Phys. Sc. Compre., Formulation, Verb. Reas. and Mechanical Reasoning.

Thus, our results, on the whole, show that B.Sc. final and M.Sc. final year students fare better than the B.Sc. 1st year students, though the difference here is less noticeable compared to the difference between the B.E. 1st year students and the B.E. Final students.

Comparing the professional group of Engineers and Research scholars with all the other groups, it is found that, in four tests, Verb. Reas., Arith. Reas., Formulation and Phy. Sc. Comprehn. they score higher than all the other groups. In the other three tests, Abst. Reas., Mech. Reas. and Space Rels. they score slightly less than only the B.E. Final group. The B.E. final group turned out to be best on all the tests, compared to all other student groups. The tests, thus, appear to differentiate the B.E. final students and the professional group clearly from all the other groups, thus, showing evidence of validity. The latter two groups between themselves, show only one significant difference (Verb. Reas.) where the professional group appears to be significantly better.

Part III: Comparison of performance of our (Indian) subjects with the performance of American subjects.

In attempting this comparison, only the B.E. 1st year group of ~~our~~ the main sample was compared with the American group. This was done for two reasons.

(1) As already mentioned, the American performances selected for the three EPSAT tests were of students in Introductory Engineering Course. Hence, it was thought, it would be more appropriate to select our B.E. 1st year group for comparison.

(2) The B.E. 1st year group showed significantly better performance than the B.Sc. 1st year and B.A. 1st year groups. Our comparison shows that even this best group ~~of ours~~ in our sample was not very favourably placed in comparison with the American

subjects. Hence, it was felt that no purpose would be served by comparing the B.Sc. 1st year and the B.A. 1st year with the American Ss.

Comparing ~~our~~ the B.E. 1st year with the American Ss, it is found that, in all the ~~tests~~ seven tests the differences are significant. Out of these, in two tests, Abst. Reas. and Formul. ~~our~~ the B.E. 1st year group does better, significantly than the American subjects. The difference is more noticeable in Formulation than in Abst. Reas. In all the other five tests, the American 12th grade and the Introductory Engineering students have higher scores. In three tests, Mech. Reas., Space. Rela., and Verbal Reas. the superiority of the American subjects is very distinct.

The results are revealing. The American subjects show clear superiority over ~~our~~ the B.E. 1st year in all the tests of Engineering aptitude excepting Formul., tests of general intelligence, and in Physical Science Comprehension. Though our group is a pure Engineering group, in many tests, they appear to be inferior to even the general 12th grade students of America, in tests like Mech. Reas., and Space Rela., which are supposed to measure Engineering aptitude.

It may be of interest to compare ~~our~~ the B.E. final group with the American group. In two tests, Mech. Reas. and Verb. Reas. the American 12th grade students score # higher than ~~our~~ the B.E. final group. In one test, Space Relations, ~~our~~ the B.E. final group and the American 12th grade have equal scores. In the remaining four tests, Abst.

Reas., Arith. Reas., Formulation and Phy.Sc. Compre. performance of ~~our~~ the B.E. final group ~~were~~ is better compared to the American 12th grade and Introductory Engineering students, respectively. Thus, it is found that, the American 12th grade and Introductory Engineering students are superior to even ~~our~~ the B.E. final group, in some tests. On the whole, our results show that the performance of American students is considerably better compared to Indian subjects.

IMPORTANT FINDINGS:

At the end of the chapter, the following important findings may be stated:

(1) On the whole, the B.Sc. final, B.E. Final, M.Sc. final and professional groups do better on the tests than the freshman group.

(2) The superiority of these 'successful groups' is seen clearly when the B.E. 1st year and the B.E. final are compared and also the B.Sc. 1st year and the B.Sc. final and M.Sc. groups are compared.

(3) American 12th grade and Introductory Engineering Course students show a distinct superiority over ~~our~~ Indian B.E. 1st year group, in five out of seven tests, the two exceptions being Abst. Reas. and Formulation.

(4) It is surprising that American students of the 12th grade and Introductory Engineering course score higher than even our B.E. final group, in two tests, and equal the performance in another test.

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CHAPTER VII

SUMMARY OF THE FINDINGS AND SUGGESTIONS FOR FURTHER STUDIES

The present investigation, as already mentioned, was undertaken to make what may be called a diagnostic study of the aptitudes and interests of college students with particular reference to engineering and science students. The specific objectives of the investigation may be stated as follows:

(A) To find out whether there are many students in the degree classes who do not have the necessary aptitude, as measured by certain standardised psychological tests, for the courses they are in.

(B) To find out whether these students are interested in the courses they are studying and to find out their general attitude to these courses.

(C) To find out whether these students have vocational preferences which are in keeping with the courses of study pursued by them

(D) To compare the performance of our students with the Americans students.

In addition to these main objectives, it was felt that this investigation would serve the following purposes:

(i) To provide some basic data on the aptitudes and interest patterns of our student population.

(ii) To initiate further research in this area so that ultimately norms could be established which could be employed for admission and selection purposes.
(iii) To throw some light on the ability of the selected psychological tests for our population.

A battery of seven tests, four from the Differential Aptitude Tests(Abst. Reas., Mech. Reas., Space Rels. and Verb. Reas.) and three tests from Moore's Engineering and Physical Sciences Aptitude Tests(Arithmetic Reasoning, Formulation, and Phy. Sc. Compre) were selected. These tests were selected on the assumption that they would cover the abilities required for the Engineering and Science courses. The seven tests were grouped as follows:
(A) Abst. Reas., Arith. Reas., and Verb. Reas. - to measure scholastic aptitude.
(B) Mech. Reas., Space Rels., Formulation and Phy. Sc. Compre. - as Engineering and Science aptitude tests.

All these tests along with a questionnaire specially constructed to measure educational interests and attitudes were administered to a group of students of B.E. 1st year, B.Sc. Ist year and B.A. 1st year classes to test the suitability. A few modifications in the questionnaire had to be made. The preliminary study was also meant to establish the time limits for the tests, under Indian conditions. A vocational interest blank, prepared for this investigation, was also included subsequently.

The different tests and questionnaires were administered to a fairly large number of students of B.E. 1st year,

B.Sc. 1st year and B.A. 1st year groups. The last mentioned group was included as a control group, against which performance of the other two groups could be compared in the absence of published norms for the Indian student population. In addition to these groups, the aptitude tests were administered to a group of final year students in Engineering and Science courses, a group of M.Sc. students and research workers in science and a group of working engineers. The results were analysed statistically.

CERTAIN LIMITATION & DIFFICULTIES

In the course of the investigation, several difficulties were encountered necessitating some modifications of the original plan. Some of these are as follows:

(1) Due to the non-availability of tests, standardised for the Indian population, tests standardised in the United States had to be employed. However, in view of the fact that they were all tests of ability in specific and well defined areas, it was felt that the factor of culture-centeredness may not be very important.

(2). In the absence of established norms, the analysis had to depend on intergroup comparison. Hence, the performance of the B.E. and B.Sc. students could be assessed only in comparison with the Arts students. To this extent, the findings have only a comparative significance.

(3) The most important difficulties, however, were the difficulties encountered in the actual collection of data. It was very difficult to get from sessions in the educational

institutions. All the tests and questionnaire together involved about 4 hours' work and the authorities of the institutions were either reluctant or unable to provide this facility. As a consequence, in many instances, the tests had to be split into two groups and administered to matched samples.

(4) Because of the lack of adequate criteria and also time, the validity of these tests was assumed to be adequate on the ground that their validities have already been established by the authors of the tests in their country.

These limitations, no doubt, affect the value of our findings. But still, it is felt that these findings may not completely lack in validity and reliability, and though they may not serve any immediate practical purposes, they may, at least, initiate further research in this area. Further research may produce certain practical benefits. It is with this hope, that the following broad indications, that appeared to emerge from our investigation, are presented.

SUMMARY OF THE FINDINGS

1. On the whole, a comparison of the three groups showed that the general performance of the B.E. 1st year and B.Sc. 1st year group was distinctly superior to the performance of the B.A. group. In fact, the B.E. group was significantly superior to both the other groups showing a higher degree of scholastic aptitude and scientific

and engineering aptitudes. In fact, even on tests like Phy. Sc. Compre. and Formulation, the engineering students did better than the science students. The B.A. students performed very badly even on Verb. Reas. and Abst. Reas. where they could be expected to do as well, if not better than the science and engineering students.

However, there were a few B.A. students whose performance in a number of tests was superior to the average performance of the engineering and science students. Similarly, on different tests, there were a number of science students who did distinctly better than the average engineering student, on tests like Mech. Reas. and Space Relations, where engineering students would be expected to score very high. On the other side, there were a few engineering and science students, whose performance was lower than the 25th percentile of the B.A. students, even on tests entirely related to scientific and engineering aptitudes. This shows that though, in general, the performance of science and engineering students was superior to that of Arts students, there are instances of misfits as judged by the aptitude tests.

(2) Most of the Ss in the three groups appear to be interested in the subjects studied. This was most true of the engineering group. The general attitude to the subjects of study appear to be positive and favourable. A few exceptions to this, however, were seen in the science group where a higher percentage of students expressed

a dislike for their subjects compared to the arts group. One further point, which emerged, was that though most of Ss, though reported that they have chosen their courses on their own accord, very few of them appear to have made their choice before the age of 14 years. The engineering students, on the whole, appeared to have made their choice earlier than the other two groups. Needless to say, the arts students are the worst. Most of them appear to choose their course only after joining the course.

(3) The responses to the vocational interest blank on the whole, reveal patterns of preferences in line with the courses of study for the engineering and science groups. However, a considerable degree of preference is expressed for jobs entirely unrelated to the courses of study. Thus, many engineering and science students appear to rate diplomatic services and welfare occupations as highly preferred vocational areas. It is surprising that the arts students should have given high preference for farming. Probably, this is due to the fact that many of them come from agricultural families. Here, perhaps, there can be a doubt as to whether these choices reflect stable preferences or they reflect a lack of nature and realistic outlook.

(4) A comparison of the performance of our engineering group with the performance of comparable American students showed that, on many tests, the performance of the American group was distinctly superior. In fact, on some tests, the American group, though comparable in age and schooling to our first year group of B.E. students, was found to perform better

even better than our B.E. Final group. One has to wonder whether we can afford to have this discrepancy in view of the fact that our need for competent engineers is no less than the need of the United States of America.

SOME FINDINGS ABOUT THE TESTS

Surprisingly, the scores on the aptitude tests showed very low correlations with the performance of the engineering students in the first year's examination. This may lead us to suspect the validity of the tests. However, as already pointed out, it is equally probable that the ~~examination~~ contamination may be in the criterion, i.e. B.E. 1st year examination marks. However, when the first year groups of B.E. and B.Sc. were compared with the corresponding final year groups, research scientists and engineers, the tests were found to differentiate clearly between the first year groups and the other groups, thus, providing evidence for the validity of the tests.

SUGGESTIONS FOR FURTHER RESEARCH

As already mentioned, the findings presented above suffer from some limitations and may be only suggestive. However, it is felt that the present research can be followed by useful research along the following lines

1. Repetition of the investigation on larger samples and from different parts of the country after rectifying some of the limitations mentioned above.
2. Administration of the tests to a group of Ss followed by long term follow-up studies of these Ss.
3. A study including Ss who have been unable to secure admissions into the B.E. and B.Sc. courses and comparison of these Ss with those actually admitted.
4. Research purporting to standardise these tests and establish norms.